Unit 01

ALGEBRAIC SENTENCES

Q.1 Define the following. *(L.B 2009)*

Ans: **(i) True Sentences:** Sentences, which are true according to the given conditions, are called true sentences.

e.g. $3+4=7$,

$7+8<19$

(ii) False Sentences: Sentences which are false according to the given conditions are called false sentences. e.g. $3+10<8$, $6<2+3$

(iii) Open Sentences: Sentences about which it is not possible to say if they are true or false called open sentences. e.g. $12x>3$, $2x+1=9$

(iv) Equations: Sentences involving the equality sign "=" between two algebraic expressions are called equations. e.g. $x+2=6$

(v) In-equations: Sentences involving symbols < or > etc. between two algebraic expressions are called in-equations.

e.g. $5y-3>5$

(vi) Radical Equations:

The equations in which variable is placed under the radical sign are called radical equations. e.g. $\sqrt{x}-10=2$

(vii) Absolute Valued Equations:

Equations involving the absolute variables are called absolute valued equations.

e.g. $|x|=3$

(viii) Extraneous Roots. *(L.B 2009)*

The value of the variable of a radical equation obtained by solving the equation, not satisfying the equation is called extraneous root of the equation.

(ix) Compound Sentences: Sentences which consist of two open sentences are called compound sentences or any sentence which contains two conditions is called compound sentence.

e.g. $1<x<4$, $x\geq 4$

(x) Quadratic Equation: A polynomial equation of second degree is called Quadratic Equation. e.g. $ax^2+bx+c=0$

(xi) Algebraic Sentence

When two algebraic expressions are related by any of the symbols $<$, $>$, $\leq$, $\geq$ $=$, $\neq$ etc, they form an algebraic sentence.

(xii) Absolute value of any Real Number

Absolute value of any real number x is represented by $|x|$. $|x|$ is defined as $|x|=+x$ (when x is positive real number) $|x|=-x$ (when x is negative real number).

Q.2 Write types of open sentences.

Open sentences are two types.

(i) Equations

(ii) in-equation

Q.3 Write types of Algebraic sentences.

Algebraic sentences are of three types

(i) True sentences

(ii) False sentences

(iii) Open sentences

Exercise 1.1

Q.1 Which of the following are algebraic expressions and which of them algebraic sentences?

i. $2x + 3$

Sol: It is an algebraic expression.

ii. $2x = 1$

Sol: It is an algebraic sentence.

iii. $2x - 5 < -3$

Sol: It is an algebraic sentence.

iv. $3x + 2y + z$

Sol: It is an algebraic expression.

v. $\frac{1}{\sqrt{3}}z - 1$

Sol: It is an algebraic expression

vi. $\frac{x-1}{2} = \frac{2}{3}$

Sol: It is an algebraic sentence

Q.2 Identity true and false sentences:

i. $3 + 4 = 6$

Sol: It is a false sentence.

ii. $3 + 7 < -5$

Sol: It is a false sentence.

iii. $7 + 5 > 6$

Sol: It is a true sentence.

iv. $3 + 2 > 4$

Sol: It is a true sentence.

v. $-7 < +15$

Sol: It is a true sentence.

vi. $-6 + 4 > 2$

Sol: It is a false sentence.

Q.3 Identify open sentences from the following:

Sol.

i. $3 + 4 < 2x$

This is an open sentence

ii. $3 + 4x = 5$

This is an open sentence

iii. $7 - 3 > 12$

This is not an open sentence.

iv. $3 + 5 < 2x$

This is an open sentence

v. $15 - 8 < 12$

This is not an open sentence

vi. $2y + 5 = 15$

This is an open sentence

vii. $10 > 2z$

This is an open sentence

viii. $3x + 5x = 8x$

This is not an open sentence

ix. $6x + 10 = -2$

This is an open sentence

Q.4 Identity the equations and in-equations:

Sol:

i. $3x + 2 = 5$

Sol: It is an equation

ii. $3x + 2 > 10$

Sol: It is an in-equation

iii. $2y = 10$

Sol: It is an equation

iv. $3y + 8 < 11$

Sol: It is an in-equation

v. $\frac{1}{2}x - 5 = \frac{1}{3}$

Sol: It is an equation

vi. $2x - 10 = \frac{1}{2}$

Sol: It is an equation

Q.5 Identity the linear equations from the following:

i. $x - 5 < 3$

Sol: It is not a linear equation.

ii. $x + 2 = -\frac{1}{2}$

Sol: It is a linear equation.

iii. $\frac{x+1}{2} = \frac{1}{5}$

Sol: It is a linear equation.

iv. $5 - z > 2z$

Sol: It is not a linear equation.

v. $lx + m = 0$

Sol: It is a linear equation.

vi. $x + c = 0$

Sol: It is a linear equation.

Q.6 Solve the following linear equations.

i. $\frac{y}{2} - 5 = 1$

Sol: Given equation is:

$$\frac{y}{2} - 5 = 1$$
$$\frac{y}{2} = 1 + 5$$
$$\frac{y}{2} = 6$$
$$y = 12$$

So req. S.S is $\{12\}$

ii. $2x + 3 = \frac{5}{2}$

Sol: Given equation is:

$$2x + 3 = \frac{5}{2}$$

Multiplying both sides by 2

$$4x + 6 = 5$$
$$4x = 5 - 6$$
$$4x = -1$$
$$x = -\frac{1}{4}$$

So req. S.S is $\left\{-\frac{1}{4}\right\}$

iii. $\frac{2}{3}(x-1) = \frac{1}{3}$

Sol: Given equation is:

$$\frac{2}{3}(x-1) = \frac{1}{3}$$

Multiplying both sides by 3

$$2x - 2 = 1$$
$$2x = 1 + 2$$
$$2x = 3$$
$$x = \frac{3}{2}$$

So required S.S is $\left\{\frac{3}{2}\right\}$

iv. $\frac{x}{3} - \frac{x}{4} = 2$

Sol: Given equation is:

$$\frac{x}{3} - \frac{x}{4} = 2$$

Multiplying both sides by 12

$$4x - 3x = 24$$
$$x = 24$$

So required S.S is $\{24\}$

v. $\frac{3}{5} = \frac{1}{2}\left(\frac{x-1}{3} - \frac{x}{5}\right)$

Sol: Given equation is:

$$\frac{3}{5} = \frac{1}{2}\left(\frac{x-1}{3} - \frac{x}{5}\right)$$
$$\frac{3}{5} = \frac{x-1}{6} - \frac{x}{10}$$

Multiplying both sides by 30

$$18 = 5x - 5 - 3x$$
$$18 = 2x - 5$$
$$2x - 5 = 18$$
$$2x = 18 + 5$$
$$2x = 23$$
$$x = \frac{23}{2}$$

So required S.S is $\left\{\frac{23}{2}\right\}$

vi. $\frac{x+5}{6} - \left(\frac{14-x}{2} - \frac{1}{4}\right) = \frac{2x-7}{12}$

Sol: Given equation is:

$$\frac{x+5}{6}-\left(\frac{14-x}{2}-\frac{1}{4}\right) = \frac{2x-7}{12}$$

Multiplying both sides by 12

$$12\times\frac{x+5}{6}-12\times\left(\frac{14-x}{2}-\frac{1}{4}\right) = 12\times\frac{2x-7}{12}$$

$$2x+10-12\left(\frac{14-x}{2}-\frac{1}{4}\right) = 2x-7$$

$$-10-12\left(\frac{14-x}{2}\right)+12\left(\frac{1}{4}\right) = 2x-7$$

$$2x+10-6(14-x)+3 = 2x-7$$

$$+10-84+6x+3-2x+7 = 0$$

$$6x-64 = 0$$

$$6x = 64$$

$$x = \frac{32}{3}$$

So required S.S is $\left\{\frac{32}{3}\right\}$

$$\frac{7x-1}{4}-\frac{1}{3}\left(2x-\frac{1-x}{2}\right)=\frac{19}{3}$$

Given equation is:

$$\frac{7x-1}{4}-\frac{1}{3}\left(2x-\frac{1-x}{2}\right) = \frac{19}{3}$$

Multiplying both sides by 12

$$12\times\frac{7x-1}{4}-12\times\frac{1}{3}\left(2x-\frac{1-x}{2}\right)=12\times\frac{19}{3}$$

$$3(7x-1)-4\left(2x-\frac{1-x}{2}\right) = 76$$

$$21x-3-8x+2(1-x) = 76$$

$$21x-3-8x+2-2x-76 = 0$$

$$11x-77 = 0$$

$$11x = 77$$

$$x = 7$$

equired S.S is {7}

$$\frac{1}{8}(x-2)-\frac{1}{7}(x-4)=\frac{1}{12}(2x-3)-2\frac{3}{4}$$

Given equation is:

$$-2)-\frac{1}{7}(x-4)=\frac{1}{12}(2x-3)-2\frac{3}{4}$$

iplying both sides by 168

$$21\times(x-2)-24(x-4) = 14(2x-3)-462$$

$$21x-42-24x+96 = 28x-42-462$$

$$-3x+54 = 28x-504$$

$$28x-504 = -3x+54$$

$$28x+3x = 54+504$$

$$31x = 558$$

$$x = 18$$

So req. S.S is {18}

Q.7 Find the solution sets of the following simultaneous equations:

i. $2x + y = 1$

$x + y = 3$

Sol: Given equation are:

$2x + y = 1$ ....(1)

$x + y = 3$ ....(2)

Subtracting (2) from (1)

$x = -2$

Put in (1)

$$2(-2)+y = 1$$

$$-4+y = 1$$

$$y = 1+4$$

$$y = 5$$

So required S.S is {(– 2, 5)}

ii. $2x + y = 7$

$2x - y = 3$

Sol: Given equation are:

$2x + y = 7$ .... (1)

$2x - y = 3$ .... (2)

Adding (1) and (2)

$$4x = 10$$

$$x = \frac{5}{2}$$

Put in (1)

$$2\left(\frac{5}{2}\right)+y = 7$$

$$5+y = 7$$

$$y = 2$$

So required S.S is $\left\{\left(\frac{5}{2}, 2\right)\right\}$

iii. $2x - y = 1$

$x + 4y + 3 = 0$

Sol: Given equation are:

$2x - y = 1$ .... (1)

$x + 4y = -3$ .... (2)

Multiplying (1) by 4

$8x - 4y = 4$ ....(1)

$x + 4y = -3$ ....(2)

Adding (1) and (2)

$9x = 1$

$x = \frac{1}{9}$

Put in (1)

$2\left(\frac{1}{9}\right) - y = 1$

$\frac{2}{9} - y = 1$

$y = \frac{2}{9} - 1 = \frac{2-9}{9}$

$y = -\frac{7}{9}$

So req. S.S is $\left\{\left(\frac{1}{9}, -\frac{7}{9}\right)\right\}$

iv. $2(x - y) = 8 \Rightarrow x - y = \frac{8}{2} = 4$

$x + y = 6$

Sol: Given equation are:

$x - y = 4$ .....(1)

$x + y = 6$ .....(2)

Adding (1) and (2)

$2x = 10$

$x = 5$

Put in (1)

$5 - y = 4$

$y = 5 - 4$

$y = 1$

So required S.S is $\{(5, 1)\}$

v. $3x + 4y = 25$

$\frac{x}{3} + \frac{y}{4} = 2$

Sol: Given equation are:

$3x + 4y = 25$ ....(1)

$\frac{x}{3} + \frac{y}{4} = 2$ ....(2)

From (1)

$y = \frac{25 - 3x}{4}$ ....(3)

Put in (2)

$\frac{x}{3} + \frac{25 - 3x}{16} = 2$

Multiplying both sides by 48

$16x + 3(25 - 3x) = 96$

$16x + 75 - 9x = 96$

$7x = 96 - 75$

$7x = 21$

$x = 3$

Put in (3)

$y = \frac{25 - 3(3)}{4}$

$y = \frac{25 - 9}{4}$

$y = \frac{16}{4}$

$y = 4$

So required S.S is $\{(3, 4)\}$

vi. $\frac{x+1}{y+1} = 2$

$\frac{2x+1}{2y+1} = \frac{1}{3}$

Sol: Given equation are:

$x+1 \quad = 2y+2$

$6x+3 \ = 2y+1$

$x-2y \ = 1 \qquad \text{.........(1)}$

$6x-2y = -2 \qquad \text{.........(2)}$

Subtracting (1) and (2)

$-5x = 3 \qquad x = \frac{-3}{5}$

Put in (1)

$x - 2y = 1$

$\frac{-3}{5} - 2y = 1$

$-2y = 1 + \frac{3}{5}$

$-2y = \frac{5+3}{5}$

$-2y = \frac{8}{5}$

$y = \frac{-4}{5}$

So req. S.S is $\left\{\left(\frac{-3}{5}, \frac{-4}{5}\right)\right\}$

Exercise 1.2

i. Ayesha has some oranges. By adding $\frac{5}{3}$ of these oranges to the original number, the total becomes 80. How many oranges she has?

Sol. Let Ayesha has x number of oranges then according to given condition

$$x + \frac{5}{3}x = 80$$

$$3x + 5x = 240$$

$$8x = 240$$

$$x = 30$$

So Ayesha has 30 oranges

ii. Perimeter of a triangles is 91 cm. Length of its sides are $\frac{x+1}{2}cm$, $\frac{x+1}{3}cm$ and $\frac{x+1}{4}cm$. Find the length of each side.

Sol. Lengths of sides of given triangle are

$$\frac{x+1}{2}, \frac{x+1}{3} \text{ and } \frac{x+1}{4}$$

According to given condition perimeter of triangle = 91

$$\frac{x+1}{2} + \frac{x+1}{3} + \frac{x+1}{4} = 91$$

Multiplying both sides by 12

$$6(x+1) + 4(x+1) + 3(x+1) = 1092$$

$$6x+6+4x+4+3x+3 = 1092$$

$$13x+13 = 1092$$

$$x = 83$$

lengths of sides of triangle are:

$$\frac{x+1}{2} = \frac{83+1}{2} = \frac{84}{2} = 42cm$$

$$\frac{x+1}{3} = \frac{83+1}{3} = \frac{84}{3} = 28cm$$

$$\frac{x+1}{4} = \frac{83+1}{4} = \frac{84}{4} = 21cm$$

iii. Length of a rectangle is 3cm more than 2 times of its width. Its perimeter is 96cm. Find the length and width of the rectangle.

Sol: Let width of rectangle $= x\,cm$

Then length of rectangle $= 2x+3cm$

Now perimetre of rectangle$= 2(x+2x+3)$

$= 2x+4x+6$

$= 6x+6$

According to given condition

$$6x+6=96$$
$$6x=90$$
$$x=15$$

So width of rectangle $= 15cm$

And length of rectangle $=$

$2(15)+3=33cm$

iv. The sum of four consecutive even numbers is 140. Find the numbers.

Sol: Let the four consecutive even numbers are $x,\ x+2,\ x+4,\ x+6$

According to given condition

$$x+x+2+x+4+x+6=140$$
$$4x+12=140$$
$$4x=140-12$$
$$4x=128$$
$$x=32$$

So consecutive even numbers are $32,\ 32+2,\ 32+4,\ 32+6=32,\ 34,\ 36,\ 38$

v. If the same number is added in the numerator and the denominator of $\frac{7}{12}$, the new fraction is $\frac{3}{4}$. Find the number.

Sol: Let the required number is x.

According to given condition.

$$\frac{7+x}{12+x}=\frac{3}{4}$$

By cross multiplication

$$28+4x=36+3x$$
$$4x-3x=36-28$$
$$x=8$$

So required number is 8

vi. If the same number is added to the numerator and subtracted from the denominator of $\frac{5}{8}$, then the new fraction is $\frac{6}{7}$. Find the number.

Sol: Let x be the required number then according to given condition.

$$\frac{5+x}{8-x}=\frac{6}{7}$$

By cross multiplication

$$35+7x=48-6x$$
$$7x+6x=48-35$$
$$13x=13$$
$$x=1$$

So required number is 1

vii. A number consist of two digits whose sum is 13. On interchanging the digits, the new numbers so formed exceeds by 45 the original number. Find the number.

Sol: Let the digit at unit's place = x

Let the digit at ten's place= y

Then number is = x + 10y

If the digits are interchanged then new number is y + 10x

According to given condition

$$y+10x = x+10y+45$$
$$y+10x-x-10y = 45$$
$$9x-9y = 45$$
$$x-y=5 \quad \text{........(1)}$$

And $x+y=13$ ....(2)

Adding (1) and (2)

$2x=18$

$x=9$

Put in (1)

$9-y=5$

$y=4$

So required numbers is $= x+10y$

$= 9+10(4)$

$= 9+40$

$= 49$

viii. The sum of two different numbers is 36 and their difference is 6. Find the numbers.

Sol: Let two different numbers be $x \, and \, y$

According to given condition

$x+y=36$ ....(1)

$x-y=6$ ....(2)

Adding (1) and (2)

$2x=42$

$x=21$

Put in (1)

$21+y=36$

$y=36-21$

$y=15$

So required numbers are 21, 15

Q.2 A number consists of two digits. The digit at ten's place is 4 times the digit at unit's place. On changing the place of digits, the new number formed is 54 less than the original number. Find the numbers.

Sol: Let the at unit's place digit = x

Digit at ten's place = y

Then number is = x + 10y

If digits are interchanged then new no. is y + 10x

According to given condition

$y=4x$

$4x-y=0$ ....(1)

According to 2^{nd} condition.

$y+10x=x+10y-54$

$y+10x-x-10y=-54$

$9x-9y=-54$

$x-y=-6$ ....(2)

Subtracting (2) from (1)

$3x=6$

$x=2$

Put in (1)

$4(2)-y=0$

$y=8$

So required number is $= x+10y$

$= 2+10(8)$

$= 2+80$

$= 82$

New numbers = y + 10x

= 8 + 10(2)

= 8 + 20

= 28

Q.3 In a 2 digit numbers the sum of its digits is 12. on interchanging the position of digits. The new number formed is 54 more than the original number. Find the number.

Sol: Let the digit at unit's place = x

Digit at ten's place = y

Then number is = x + 10y

If digits are interchanged, then new number is y + 10x

Now according to given conditions

x + y = 12 -------------------(i)

According to second condition.

$y+10x=x+10y+54$

$y+10x-x-10y=54$

$9x-9y=54$

$x-y=6$ ------------------(2)

Subtracting (2) from (1)

$2x=18$

$x=9$

Put in (1)

$2x=18$

$y=9$

Hence required number is $= x+10y$

$= 9+10(3)$

$= 9+30$

$= 39$

Q.4 The sum of two numbers is 72. One number is 3 more than the two times of the other number. Find the number.

Sol: Let first number = x

2^{nd} number = y = 2x + 3

$\Rightarrow$ y = 2x + 3 ....(1)

According to given condition

x + y = 72 ....(2)

Put y = 2x + 3 in (2)

$x+2x+3=72$

$3x+3=72$

$3x = 72 - 3$

$3x = 69$

$x = \frac{69}{3} = 23$

$\therefore$ y = 2x + 3

= 2 (23) + 3

= 46 + 3

= 49

So First number is 23

And Second number is 2(23) + 3 = 49

Hence required numbers are 23, 49

***Q.5 If 1 subtracted from the* numerator and 2 is added to the denominator of a fraction it, becomes $\frac{1}{2}$. The fraction becomes $\frac{2}{3}$, when 1, is subtracted from its numerator and 2, from its denominator. Find the fraction.**

Sol: Let the req. fraction be $\frac{x}{y}$

Where x is numerator and y be the denominator

According to given condition:

$\frac{x-1}{y+2}=\frac{1}{2}$

or $2x-2=y+2$

$2x-y=4$ ....(1)

Also $\frac{x-1}{y-2}=\frac{2}{3}$

$3x-3=2y-4$

$3x-2y=-1$ ......(2)

Multiplying (1) by 2

$4x-2y=8$ ....(1)

$3x-2y=-1$ ....(2)

Subtracting (2) from (1)

$x=9$

Put in (1)

$4(9)-2y=8$

$36-2y=8$

$-2y=8-36$

$-2y=-28 \Rightarrow y=\frac{-28}{-2}$

$y=14$

So required fraction is $\frac{x}{y}=\frac{9}{14}$

Q.6 The sum of the numerator and the denominator of a fraction is 10. If the numerator is multiplied by 3 and the denominator by $\frac{1}{2}$, the fraction becomes $\frac{2}{3}$. Find the fraction.

Sol: Let the fraction be $\frac{x}{y}$

Where x is the numerator and y be the denominator

According to given condition

$x+y=10$ ……….(1)

$\frac{3x}{\frac{1}{2}y}=\frac{2}{3}$

By cross multiplication

$9x=y$

$9x-y=0$ ………(2)

Adding (1) and (2)

$10x=10$

$x=1$

Put in (1)

$1+y=10$

$y=9$

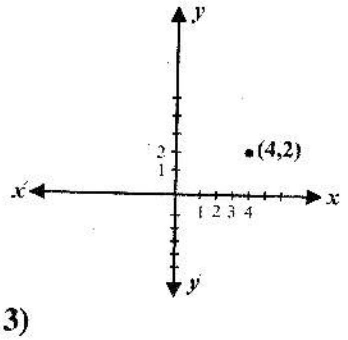
So req. fraction is $\frac{1}{9}$

Exercise 1.3

Q.1 Plot the following points on graph paper.

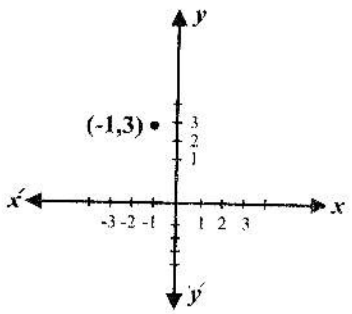
i. (4 , 2)

Sol: Given point (4, 2) on graph paper is as shown.



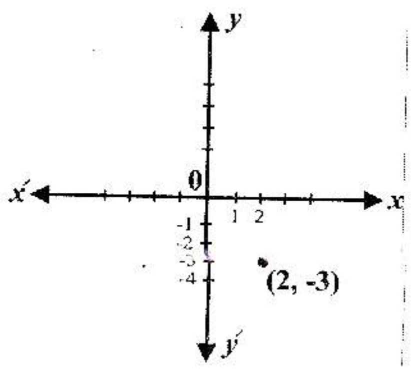
ii. (–1, 3)

Sol: Given point on graph paper is as shown.



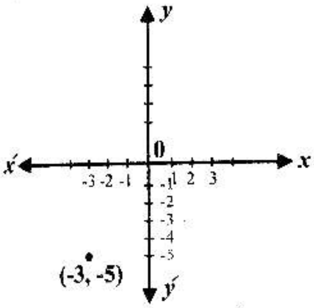
iii. (2 , – 3)

Sol: Given point on graph paper is as shown.



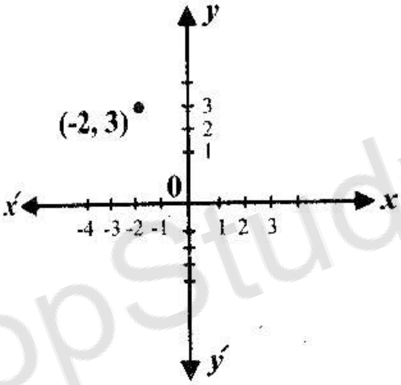
iv. (-3, -5)

Sol: Given point on graph paper is as shown.



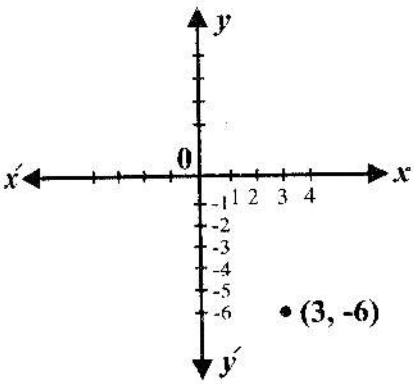
v. (-2, 3)

Sol: Given point on graph paper is as shown.



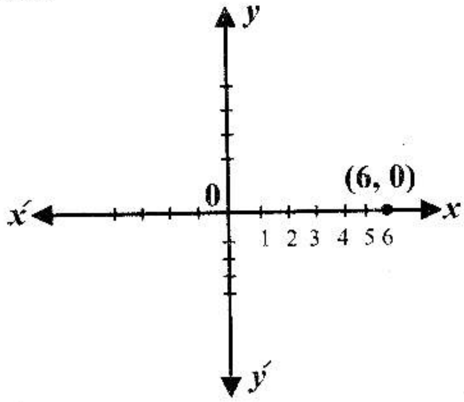
vi. (3, – 6)

Sol: Given point on graph paper is as shown.



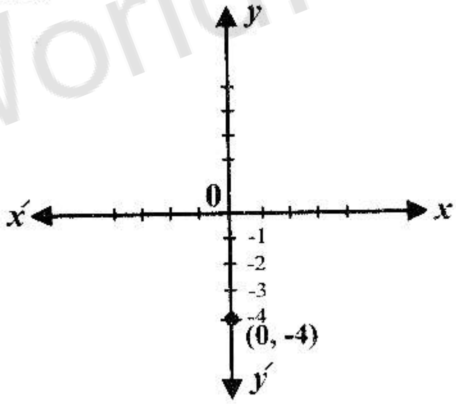
vii. (6, 0)

Sol: Given point on graph paper is as shown.



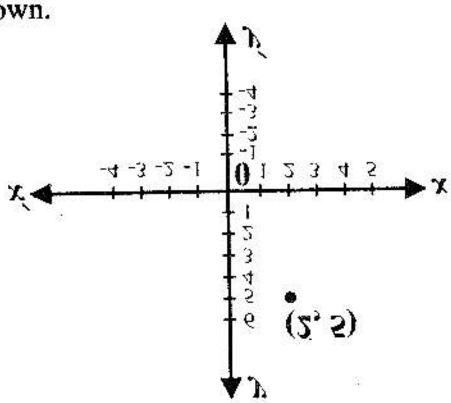
viii. (0, – 4)

Sol: Given point on graph paper is as shown.



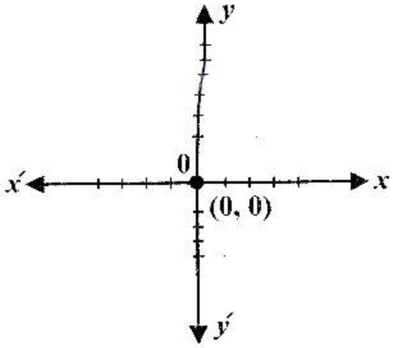
ix. (2, 5)

Sol: Given point on graph paper is as shown.



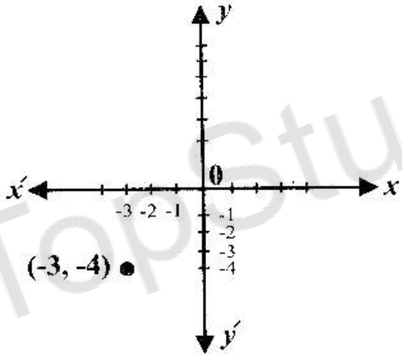
x. (0, 0)

Sol: Given point on graph paper is as shown.



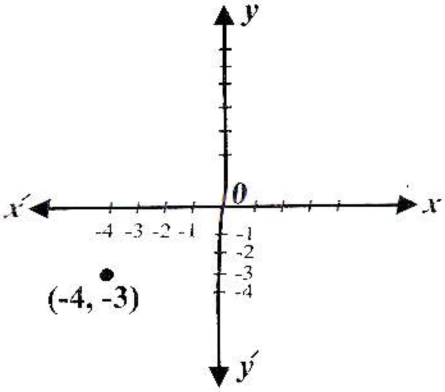
xi. (– 3, – 4)

Sol: Given point on graph paper is as shown.

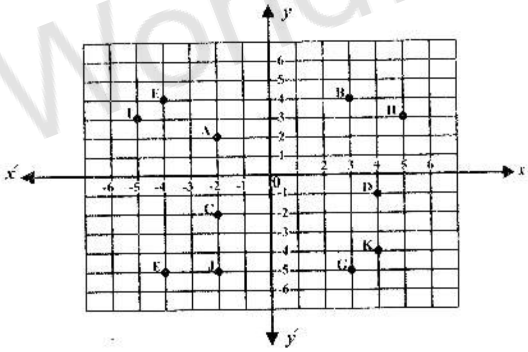


xii. (– 4, – 3)

Sol: Given point on graph paper is as shown.



Q.2 Different points are shown on the graph paper given below. Write their co-ordinates.



Sol: The co-ordinates of given points are as

$A(-2,2)$; $B(3,4)$

$C(-2,-2)$; $D(4,-1)$

$E(-4,4)$; $F(-4,-5)$

$G(3,-5)$; $H(5,3)$

$I(-5,3)$; $J(-2,-5)$

$K(4,-4)$

Exercise 1.4

Q.1 Plot the graph of following by taking at least eight ordered pairs ($x, y \in R$)

ii. $\{(x, y) \mid 2x-3y=10\}$

Sol: Given $\{(x, y) \mid 2x-3y=10\}$

Consider

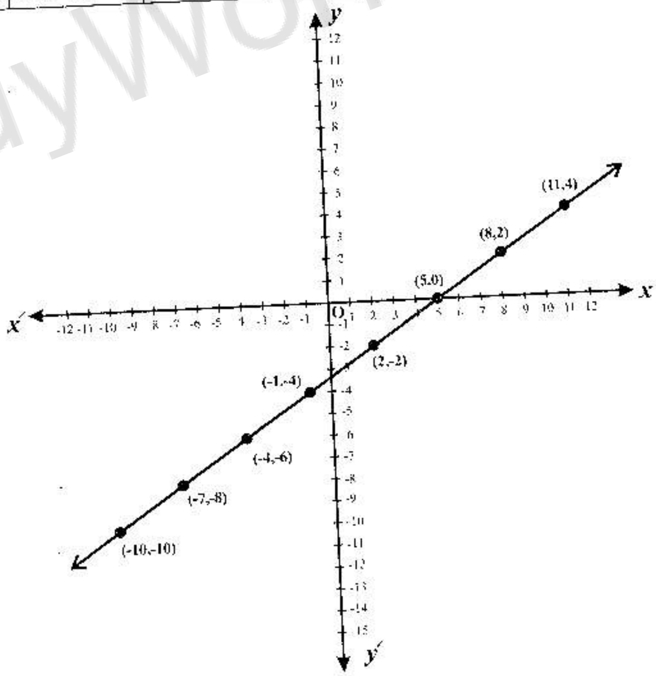
$$2x-3y=10$$

$$y=\frac{2x-10}{3}$$

The table of values for different values of x is

X	-10	-7	-4	-1	2	5	8	11
Y	-10	-8	-6	-4	-2	0	2	4
(x, y)	(-10,-10)	(-7,-8)	(-4, -6)	(-1, -4)	(2, -2)	(5, 0)	(8, 2)	(11, 4)
P(x, y)	$P_1(-10,-10)$	$P_2(-7,-8)$	$P_3(-4, -6)$	$P_4(-1, -4)$	$P_5(2, -2)$	$P_6(5, 0)$	$P_7(8, 2)$	$P_8(11, 4)$

Locating these points in Cartesian plane & joining then together we get the required graph as shown.



iii. $\{(x, y) \mid x-y=7\}$

Sol: Given $\{(x, y) \mid x-y=7\}$

Consider

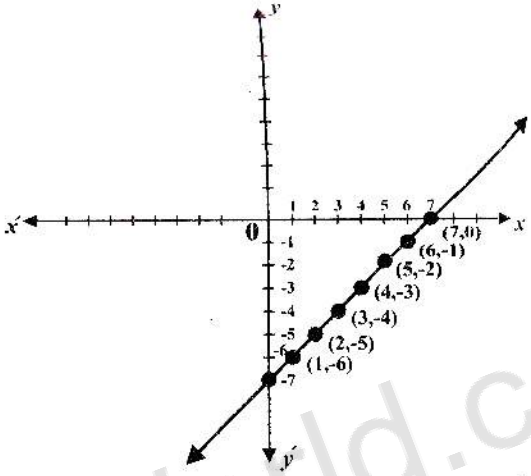
$$x-y=7$$

or $y=x-7$

The table of values for different values of x is

x	7	6	5	4	3	2	1	0
y	0	−1	−2	−3	−4	−5	−6	−7
(x, y)	(7, 0)	(6, −1)	(5, −2)	(4, −3)	(3,−4)	(2, −5)	(1, -6)	(0, −7)
P(x, y)	$P_1(7, 0)$	$P_2(6,-1)$	$P_3(5,-2)$	$P_4(4,-3)$	$P_5(3,-4)$	$P_6(2,-5)$	$P_7(1,-6)$	$P_8(0,-7)$

Locating these points in Cartesian plane and joining them together we get the required graph as shown.



iv. $\{(x, y) | 2x = y - 3\}$

Sol: Given

$\{(x, y) | 2x = y - 3\}$

Consider

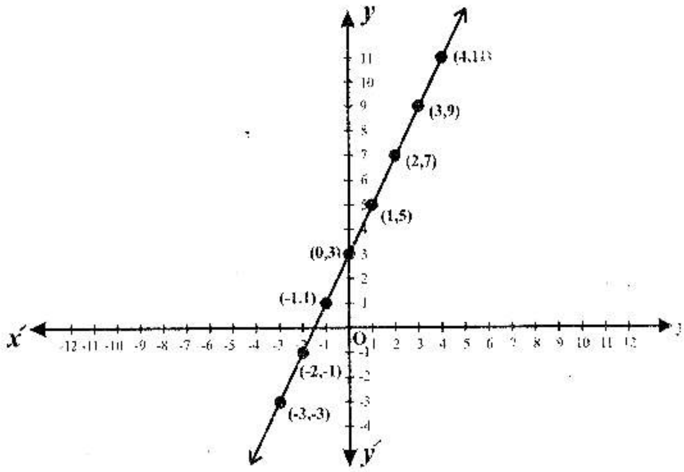
$$2x = y - 3$$

$$y = 2x + 3$$

The table of values for different values of x is

x	-3	-2	-1	0	1	2	3	4
y	-3	-1	1	3	5	7	9	11
(x, y)	(-3, -3)	(-2, -1)	(-1, 1)	(0, 3)	(1, 5)	(2, 7)	(3, 9)	(4, 11)
$P_{(x, y)}$	$P_1(-3, -3)$	$P_2(-2, -1)$	$P_3(-1, 1)$	$P_4(0, 3)$	$P_5(1, 5)$	$P_6(2, 7)$	$P_7(3, 9)$	$P_8(4, 11)$

Locating these points in Cartesian plane & joining then together we get the required graph as shown.



Q.2 Plot the graph of following by taking at least four ordered pairs (x, y ∈ R)

i. $2x + y = 3$

Sol: Given equation is:

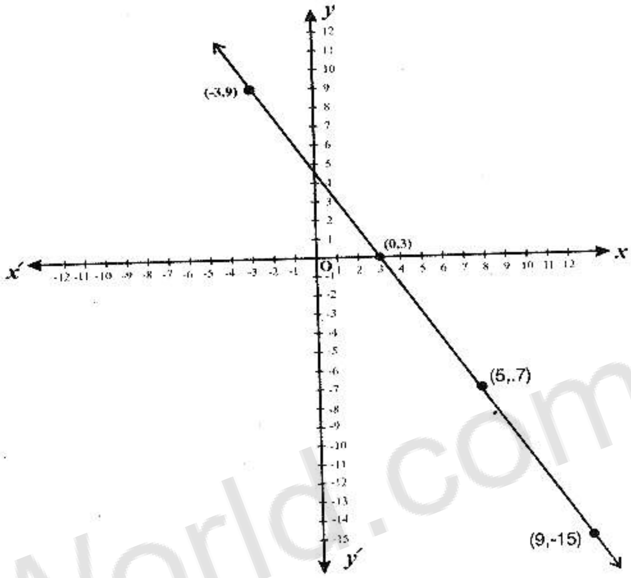
$$2x + y = 3$$

$$y = 3 - 2x$$

The table of values for different values of x is

x	0	5	9	-3
y	3	-7	-15	9
(x, y)	(0, 3)	(5, -7)	(9, -15)	(-3, 9)
P (x, y)	$P_1(0, 3)$	$P_2(5, -7)$	$P_3(9, -15)$	$P_4(-3, 9)$

Locating these points in Cartesian plane & joining them together we get the required graph as:



ii. $3x + 2y = 6$

Sol: Given equation is: $3x + 2y = 6$

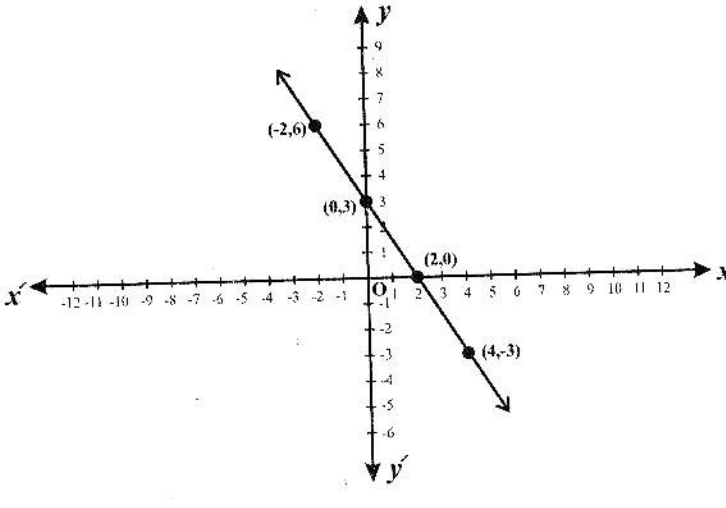
$$2y = 6 - 3x$$

$$y = \frac{6-3x}{2}$$

The table of values for different values of x is

x	−2	0	2	4
y	6	3	0	−3
(x, y)	(−2, 6)	(0, 3)	(2, 0)	(4, −3)
P (x, y)	$P_1(-2, 6)$	$P_2(0, 3)$	$P_3(2, 0)$	$P_4(4, -3)$

Locating these points in Cartesian plane and joining then together we get the required graph as:



iii. $4x + y = 9$

Sol: Given equation is:

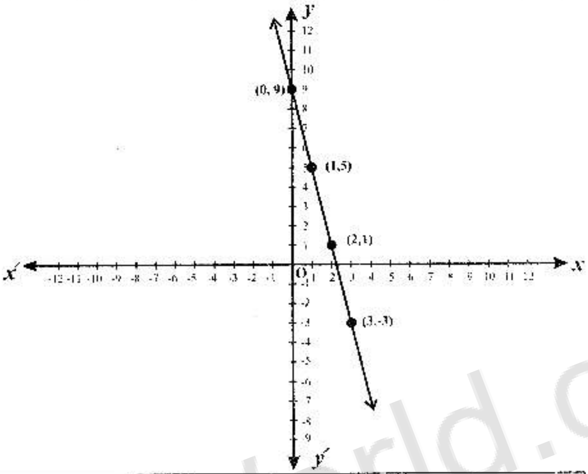
$$4x + y = 9$$

$$y = 9 - 4x$$

The table of values for different values of x is

x	0	1	2	3
y	9	5	1	-3
(x, y)	(0, 9)	(1, 5)	(2, 1)	(3, -3)
P (x, y)	$P_1(0, 9)$	$P_2(1, 5)$	$P_3(2, 1)$	$P_4(3, -3)$

Locating these points in Cartesian plane and joining then together we get the required graph as:



iv. $x=\frac{1}{2}(y+2)$

Sol: Given equation is: $x=\frac{1}{2}(y+2)$

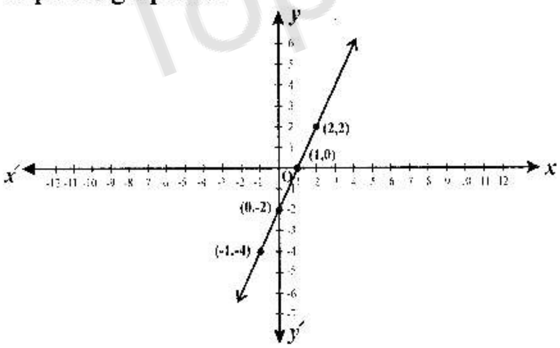
$$y+2=2x$$

$$y=2x-2$$

The table of values for different values of x is

x	-1	0	1	2
y	- 4	-2	0	2
(x, y)	(-1,- 4)	(0, - 2)	(1,0)	(2, 2)
P (x, y)	P_1(-1,- 4)	P_2(0, -2)	P_3(1,0)	P_4(2, 2)

Locating these points in Cartesian plane and joining then together we get the required graph as:



v. $y-x-5=0$

Sol: Given equation is:

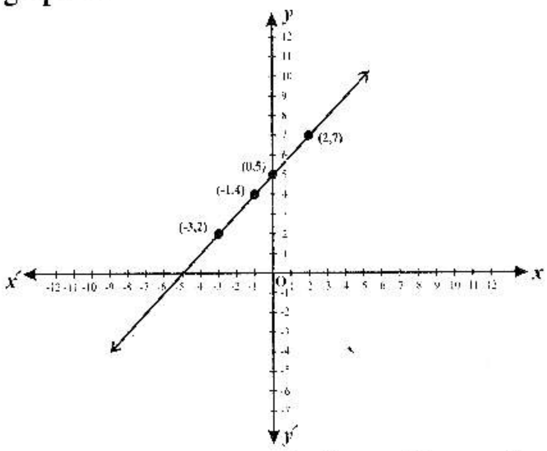
$$y-x-5=0$$

$$y=x+5$$

The table of values for different values of x is

x	-3	-1	0	2
y	2	4	5	7
(x, y)	(–3,2)	(–1, 4)	(0, 5)	(2, 7)
P (x, y)	P_1(–3,2)	P_2(–1, 4)	P_3(0, 5)	P_4(2, 7)

Locating these points in Cartesian plane & joining then together we get the required graph as:



Q.3 Plot the graph by taking only two points (x, y $\in R$)

i. $3x-4=5y$

Sol: Given equation is:

$$3x-4=5y$$

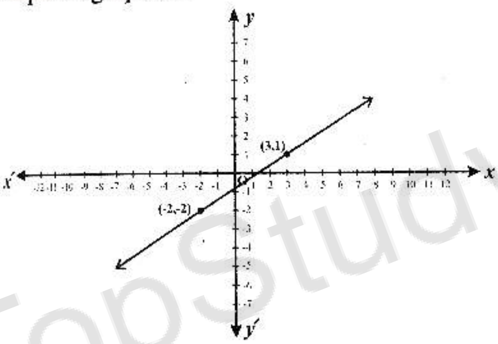
or $5y=3x-4$

$$y=\frac{3x-4}{5}$$

The table of values for different values of x is

x	-2	3
y	-2	1
(x, y)	(-2, -2)	(3, 1)
P(x, y)	$P_1(-2, -2)$	$P_2(3, 1)$

Locating these points in Cartesian plane and joining then together we get the required graph as:



ii. $2x - 5 = -13y$

Sol: Given equation is:

$$2x-5=-13y$$

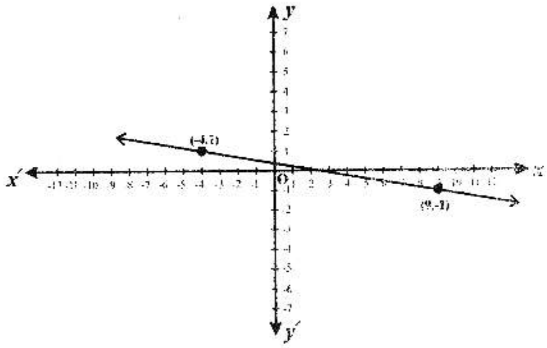
$$13y=5-2x$$

$$y=\frac{5-2x}{13}$$

The table of values for different values of x is

x	– 4	9
y	1	– 1
(x, y)	(–4,1)	(9, –1)
P(x, y)	$P_1(-4,1)$	$P_2(9, -1)$

Locating these points in Cartesian plane and joining then together we get the required graph as:



iii. $y - 2x + 5 = 0$

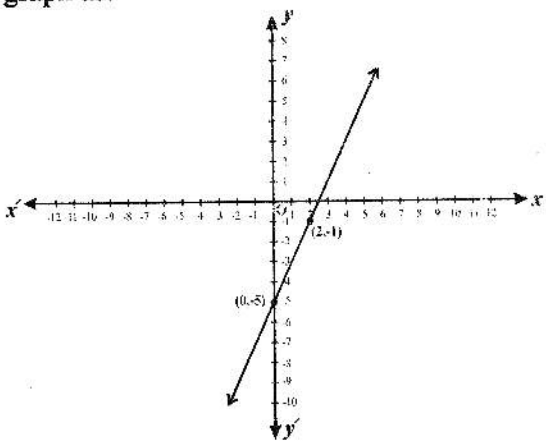
Sol: Given equation is: $y - 2x + 5 = 0$

or $y=2x-5$

The table of values for different values of x is

x	0	2
y	– 5	– 1
(x, y)	(0,– 5)	(2, –1)
P(x, y)	$P_1(0,-5)$	$P_2(2, -1)$

Locating these points in Cartesian plane & joining then together we get the required graph as:



iv. $-4y + 3x = 7$

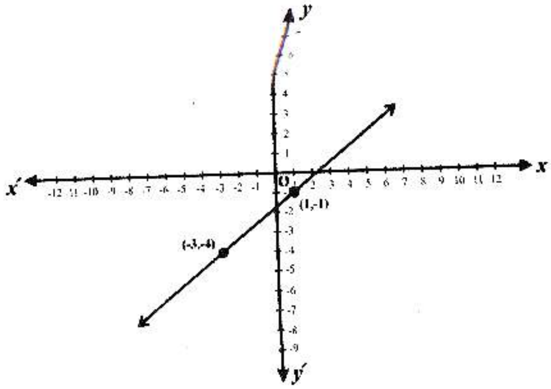
Sol: Given equation is:

$$-4y+3x=7$$
$$4y=7-3x$$
$$4y=3x-7$$
$$y=\frac{3x-7}{4}$$

The table of values for different values of x is

x	-3	1
y	-4	- 1
(x, y)	(-3,-4)	(1, –1)
P(x, y)	P_1(-3, -4)	P_2(1, –1)

Locating these points in Cartesian plane & joining then together we get the required graph as:



v. $\frac{x}{3}+y=-5$

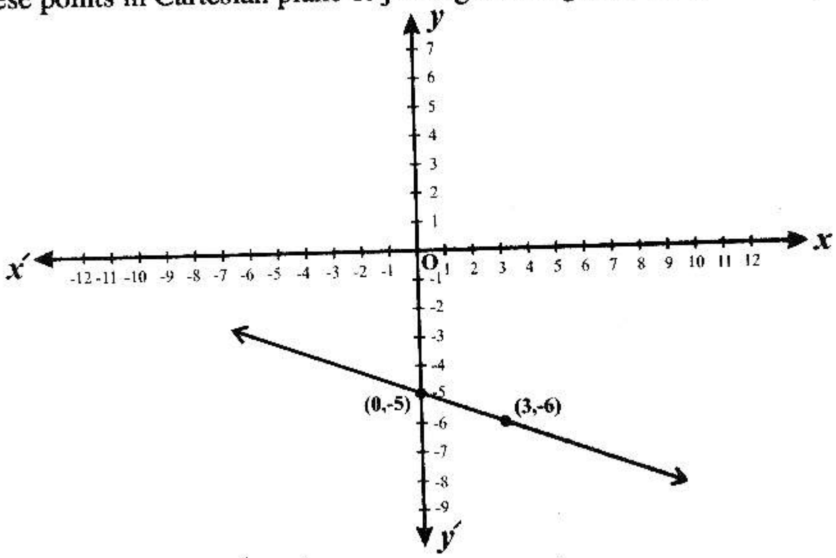
Sol: Given equation is: $\frac{x}{3}+y=-5$

$$y=-5-\frac{x}{3}$$

The table of values for different values of x is

x	0	3
y	–5	– 6
(x, y)	(0,– 5)	(3, –6)
P(x, y)	P_1(0,– 5)	P_2(3, –6)

Locating these points in Cartesian plane & joining then together we get the required graph as:



Exercise 1.5

Find the solution set of following simultaneous equations graphically and check (when x, $y \in R$)

Q.1 $x + 2y = 5$, $5x + y = 7$

Sol: Give equations are:

$x + 2y = 5$ ....(1)

$5x + y = 7$ ....(2)

From (1)

$$y = \frac{5-x}{2}$$

The Table of Values is

x	1	3
y	2	1
(x,y)	(1,2)	(3,1)

From (2)

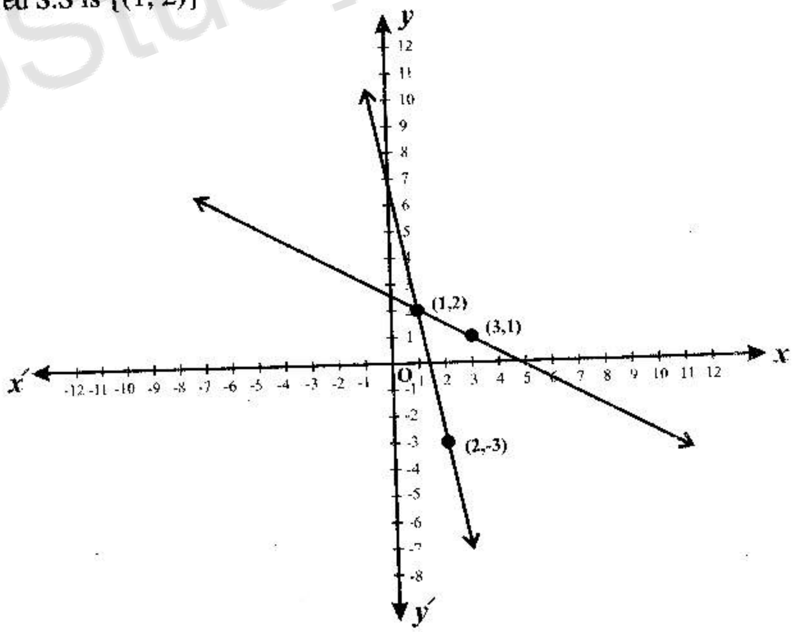
$$y = 7 - 5x$$

The Table of Values is

x	1	2
y	2	-3
(x,y)	(1,2)	(2, −3)

The graph of both lines intersect at point (1,2)

There is required S.S is $\{(1, 2)\}$

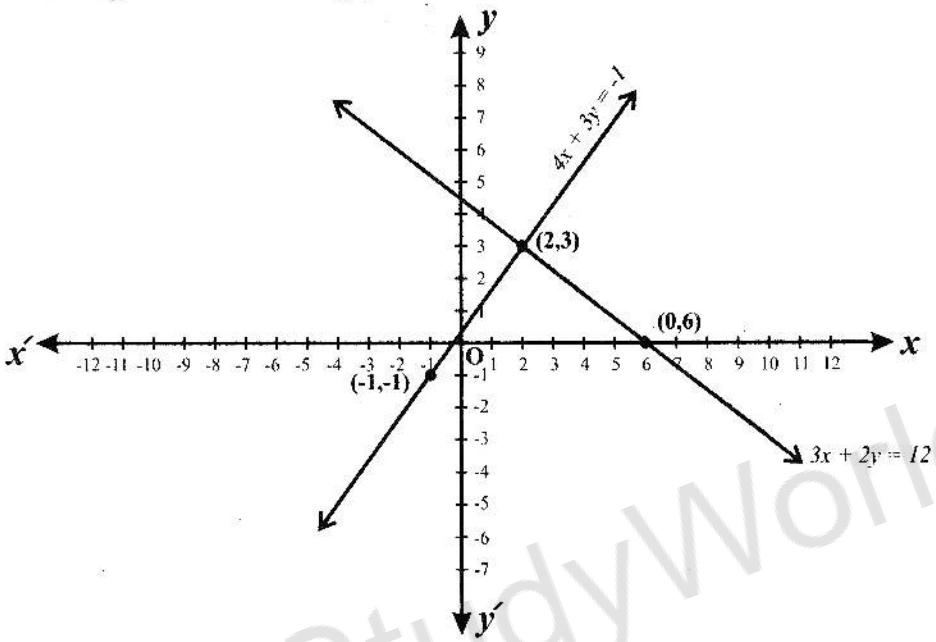


Q.2 $3x + 2y = 12$, $4x - 3y = -1$

Sol: Give equations are:

$3x + 2y = 12$ ....(1)

$4x-3y=-1 \qquad \text{........(2)}$



The graph of both lines intersect at point (2,3)

There is required S.S is {(2, 3)}

From (1)

$$y=\frac{12-3x}{2}$$

The Table of Values is

x	0	2
y	6	3
(x,y)	(0,6)	(2,3)

From (2)

$$y=\frac{4x+1}{3}$$

The Table of Values is

x	-1	2
y	-1	3
(x,y)	(-1,-1)	(2,3)

Q.3 $\mathbf{x+y=8, \quad x-y=2}$

Sol: Give equations are:

$x+y=8 \qquad \text{.......(1)}$

$x-y=2 \qquad \text{.......(2)}$

From (1)

$$y=8-x$$

The Table of Values is

x	-1	2	1	5
y	9	6	7	3
(x,y)	(-1,9)	(2,6)	(1,7)	(5,3)

From (2)

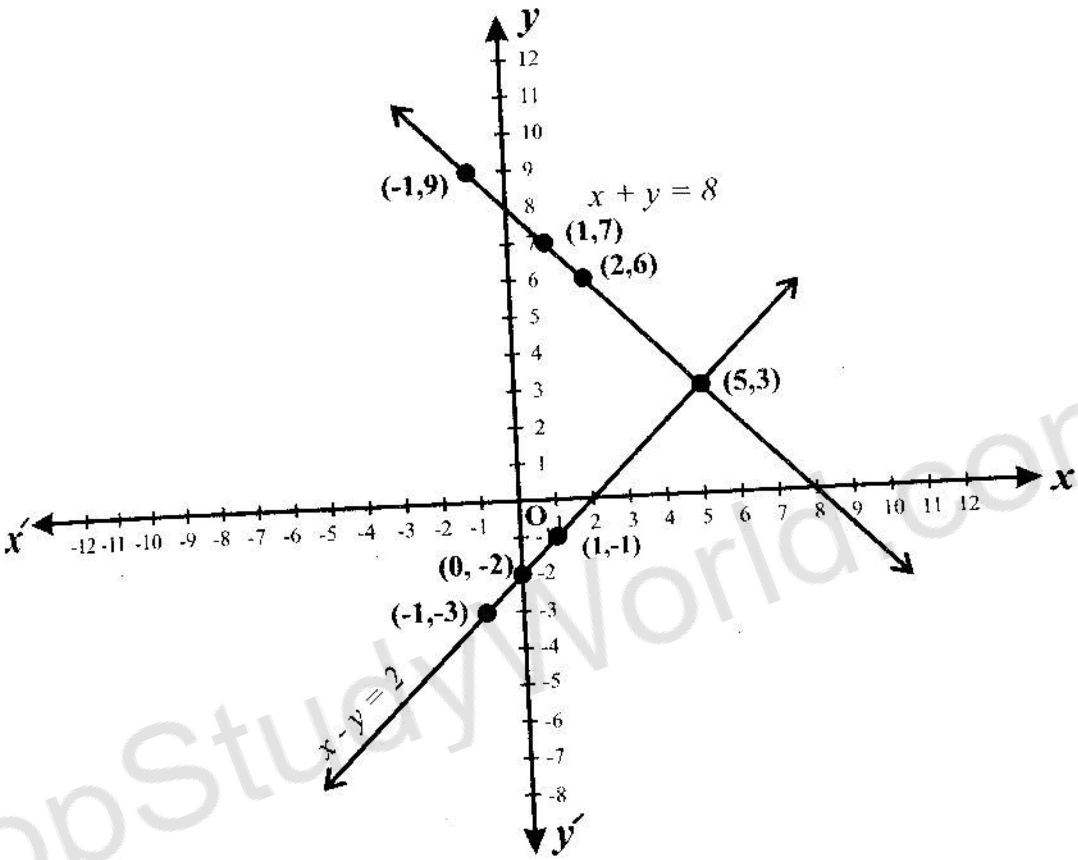
$$y=x-2$$

The Table of Values is

x	-1	0	1	5
y	-3	-2	-1	3
(x,y)	(-1,–3)	(0,–2)	(1,-1)	(5,3)

The graph of both lines intersect at point (5,3)

There is required S.S is {(5, 3)}



Q.4 $2x + 2y = 5$, $2y = 3 - 2x$

Sol: Give equations are:

$$2x + 2y = 5 \quad \text{.......(1)}$$

$$2y = 3 - 2x \quad \text{.......(2)}$$

From (1)

$$y = \frac{5 - 2x}{2}$$

The Table of Values is

x	0	1
y	2.5	1.5
(x,y)	(0, 2.5)	(1, 1.5)

From (2)

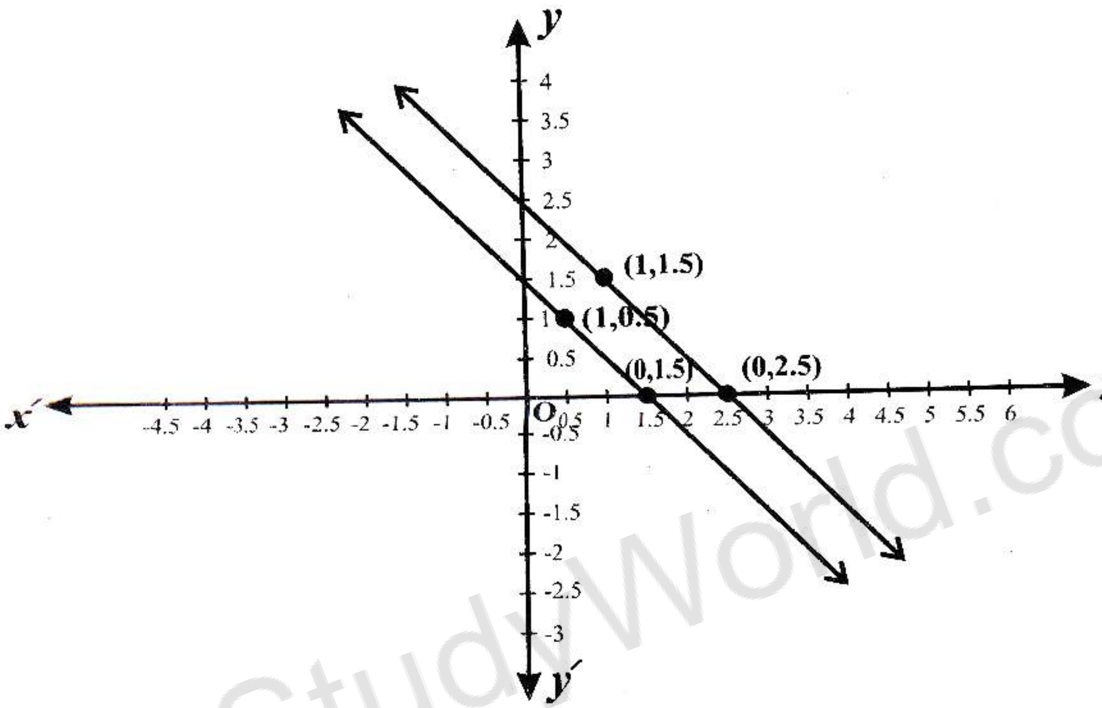
$$y = \frac{3 - 2x}{2}$$

The Table of Values is

x	0	1
y	1.5	0.5
(x,y)	(0, 1.5)	(1, 0.5)

The graph of both line do not intersect at any point.

There is required S.S is { }



Q.5 $y - 3 = 2x$, $y + x - 6 = 0$

Sol: Give equations are:

$y - 3 = 2x$ ....(1)

$y + x - 6 = 0$ ....(2)

From (1)

$y = 2x + 3$

The Table of Values is

x	0	1
y	3	5
(x, y)	(0, 3)	(1, 5)

From (2)

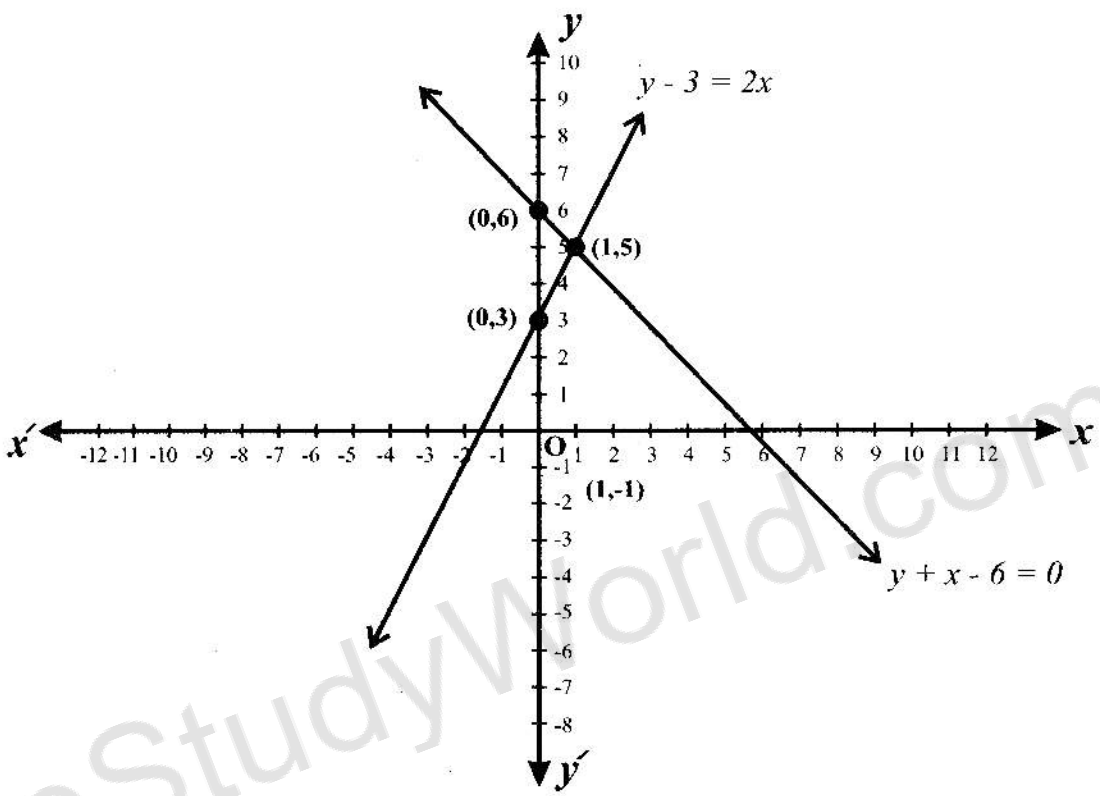
$y = 6 - x$

The Table of Values is

x	0	1
y	6	5
(x, y)	(0,6)	(1,5)

The graph of both lines intersect at point (1,5)

There is required S.S is $\{(1, 5)\}$



Q.6 $3x - y = 7$, $x = y$

Sol: Give equations are:

$3x - y = 7$ ……….(1)

$x = y$ ……….(2)

From (1)

$y = 3x - 7$

The Table of Values is

x	0	1	2
y	–7	–4	-1
(x, y)	(0, –7)	(1,-4)	(2,-1)

From (2)

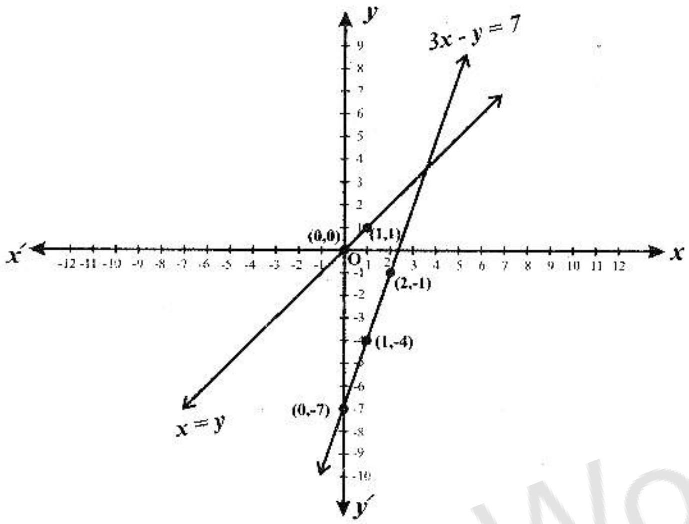
$y = x$

The Table of Values is

x	0	1
y	0	1
(x, y)	(0,0)	(1,1)

The graph of both lines intersect at point

There is required S.S is $\left\{\left(\frac{7}{2}, \frac{7}{2}\right)\right\}$



Q.7 $\mathbf{x - y = 4}$, $\mathbf{x - y = 3}$

Sol: Give equations are:

$x - y = 4$ ....(1)

$x - y = 3$ ....(2)

From (1)

$y = x - 4$

The Table of Values is

x	0	4
y	-4	0
(x, y)	$(0, -4)$	$(4, 0)$

From (2)

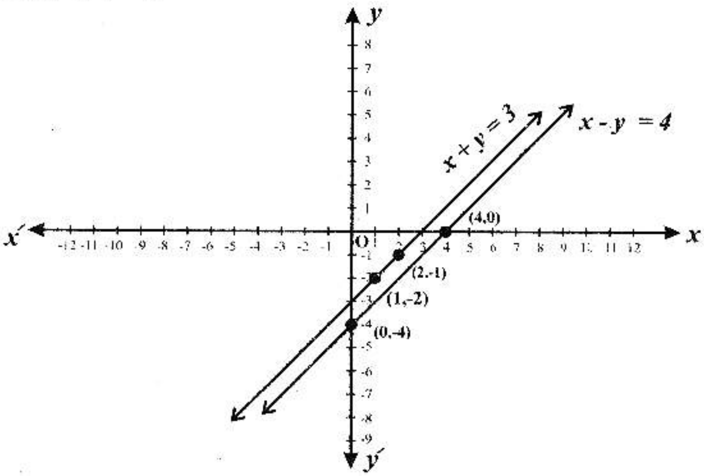
$y = x - 3$

The Table of Values is

x	1	2
y	-2	-1
(x, y)	$(1, -2)$	$(2, -1)$

The graph of both line do not intersect at any point.

So required S.S is { }



Q.8 $4x - y = 12$, $x + 2y = 3$

Sol: Give equations are:

$4x - y = 12$ ....(1)

$x + 2y = 3$ ....(2)

From (1)

$$y = 4x - 12$$

The Table of Values is

x	2	3
y	-4	0
(x, y)	$(2, -4)$	$(3, 0)$

From (2)

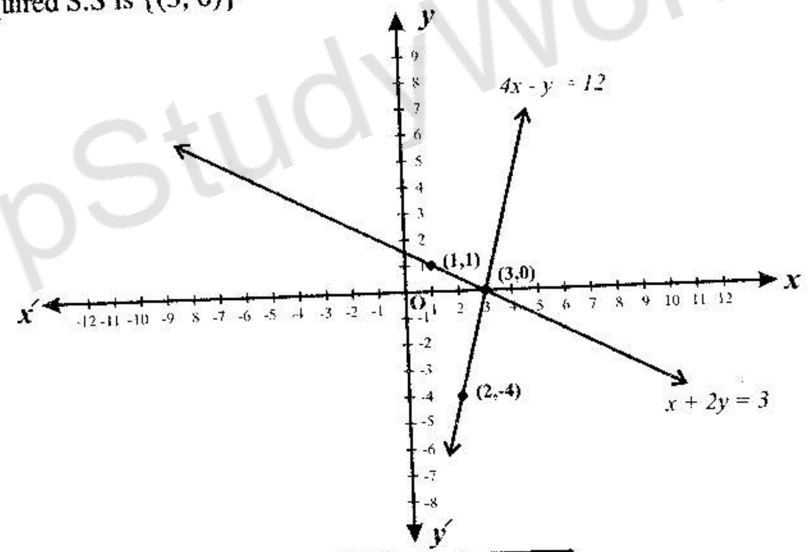
$$y = \frac{3-x}{2}$$

The Table of Values is

x	1	3
y	1	0
(x, y)	$(1,1)$	$(3, 0)$

The graph of both lines intersect at point (3, 0)

So required S.S is $\{(3, 0)\}$



Exercise 1.6

Find the solution set of following equations and check:

i. $\sqrt{x} = 2$

Sol: Given equation is:

$\sqrt{x} = 2$

Squaring both sides

$x = 4$

Check: Put $x = 4$ in given equation

$\sqrt{4} = 2$

$2 = 2$

So, S.S. is $\{4\}$

ii. $\sqrt{x}+3=6$

Sol: Given equation is:

$\sqrt{x}=6-3$

$\sqrt{x}=3$

Squaring both sides

$x=9$

Check: Put $x=9$ in given equation

$\sqrt{9}+3=6$

$3+3=6$

$6=6$

So, S.S. is $\{9\}$

iii. $2\sqrt{y}-3=1$ (Short Question)

Sol: Given equation is:

$2\sqrt{y}-3=1$

$2\sqrt{y}=4$

$\sqrt{y}=2$

Squaring both sides

$y=4$

Check: Put $y=4$ in given equation

$2\sqrt{4}-3=1$

$2\times2-3=1$

$4-3=1$

$1=1$

So, S.S. is $\{4\}$

iv. $\sqrt{y+4}+3=2$

Sol: Given equation is:

$\sqrt{y+4}+3=2$

$\sqrt{y+4}=-1$

Squaring both sides

$y+4=1$

$y=-3$

Check: Put $y=-3$ in given equation

$\sqrt{-3+4}+3=2$

$\sqrt{1}+3=2$

$1+3=2$

$4\neq2$

As equation is not satisfied

So, S.S. is $\{\ \}$

v. $2\sqrt{z}+4=20$

Sol: Given equation is:

$2\sqrt{z}+4=20$

$2\sqrt{z}=16$

$\sqrt{z}=8$

Squaring both sides

$z=64$

Check: Put $z=64$ in given equation

$2\sqrt{64}+4=20$

$2(8)+4=20$

$16+4=20$

$20=20$

So, S.S. is $\{64\}$

vi. $\sqrt{\dfrac{x-1}{2}}=2$

Sol: Given equation is:

$\sqrt{\dfrac{x-1}{2}}=2$

Squaring both sides

$\dfrac{x-1}{2}=4$

$x-1=8$

$x=9$

Check: Put $x=9$ in given equation

$\sqrt{\dfrac{9-1}{2}}=2$

$\sqrt{\frac{8}{2}} = 2$

$\sqrt{4} = 2$

$2 = 2$

So, S.S. is { 9 }

vii. $\sqrt{3y-5}+1=8$

Sol: Given equation is:

$\sqrt{3y-5}+1=8$

$\sqrt{3y-5}=7$

Squaring both sides

$3y-5=49$

$3y=49+5$

$3y=54$

$y=18$

Check: Put $y=18$ in given equation

$\sqrt{3(18)-5}+1=8$

$\sqrt{54-5}+1=8$

$\sqrt{49}+1=8$

$7+1=8$

$8=8$

So, S.S. is $\{18\}$

viii. $\sqrt{2y-3}=\sqrt{y-1}$

Sol: Given equation is:

$\sqrt{2y-3}=\sqrt{y-1}$

Squaring both sides

$2y-3=y-1$

$2y-y=-1+3$

$y=2$

Check: Put $y=2$ in given equation

$\sqrt{2(2)-3}=\sqrt{2-1}$

$\sqrt{4-3}=\sqrt{1}$

$\sqrt{1}=\sqrt{1}$

$1=1$

So, S.S. is $\{2\}$

ix. $3\sqrt{x}+5=4$

Sol: Given equation is:

$3\sqrt{x}+5=4$

$3\sqrt{x}=-1$

Squaring both sides

$9x=1$

$x=\frac{1}{9}$

Check: Put $x=\frac{1}{9}$ in given equation

$3\left(\sqrt{1/9}\right)+5=4$

$3(1/3)+5=4$

$1+5=4$

$6\neq 4$

As given equation is not satisfied

So, S.S. is { }

x. $\sqrt{1-3x}=\sqrt{5x-15}$

Sol: Given equation is:

$\sqrt{1-3x}=\sqrt{5x-15}$

Squaring both sides

$1-3x=5x-15$

$-3x-5x=-15-1$

$-8x=-16$

$8x=16$

$x=\frac{16}{8}$

$x=2$

Check:

$\sqrt{1-3x}=\sqrt{5x-15}$

$\sqrt{1-3(2)}=\sqrt{5(2)-15}$

$\sqrt{1-6}=\sqrt{10-15}$

$\sqrt{-5}=\sqrt{-5}$

S.S. = {2}

Check: Put $x=2$ in given equation

$\sqrt{1-3(2)} = \sqrt{5(2)-15}$

$\sqrt{1-6} = \sqrt{10-15}$

$\sqrt{-5} = \sqrt{-5}$

So, S.S is $\{2\}$

xi. $10-\sqrt{y+1}=12$

Sol: Given equation is:

$10-\sqrt{y+1}=12$

$-\sqrt{y+1}=2$

Squaring both sides

$y+1=4$

$y=4-1$

$y=3$

Check: Put $y=3$ in given equation

$10-\sqrt{3+1}=12$

$10-\sqrt{4}=12$

$10-2=12$

$8 \neq 12$

As given equation is not satisfied

So, S.S. is $\{\ \}$

xii. $\sqrt{\dfrac{2}{2x+3}}=\sqrt{\dfrac{1}{2x+1}}$

Sol: Given equation is:

$\sqrt{\dfrac{2}{2x+3}}=\sqrt{\dfrac{1}{2x+1}}$

Squaring both sides

$\dfrac{2}{2x+3}=\dfrac{1}{2x+1}$

By Cross multiplication

$4x+2=2x+3$

$4x-2x=3-2$

$2x=1$

$x=\dfrac{1}{2}$

Check: Put $x=\dfrac{1}{2}$ or $2x=1$ in given equation

$\sqrt{\dfrac{2}{1+3}}=\sqrt{\dfrac{1}{1+1}}$

$\sqrt{\dfrac{2}{4}}=\sqrt{\dfrac{1}{2}}$

$\sqrt{\dfrac{1}{2}}=\sqrt{\dfrac{1}{2}}$

So S.S. is $\left\{\dfrac{1}{2}\right\}$

xiii. $\dfrac{\sqrt{y}+1}{3}=4$

Sol: Given equation is:

$\dfrac{\sqrt{y}+1}{3}=4$

$\sqrt{y}+1=12$

$\sqrt{y}=11$

Squaring both sides

$y=121$

Check: Put $y=121$ in given equation

$\dfrac{\sqrt{121}+1}{3}=4$

$\dfrac{11+1}{3}=4$

$\dfrac{12}{3}=4$

$4=4$

So, S.S. is $\{121\}$

xiv. $\dfrac{\sqrt{2x+3}-14}{6}=-2$

Sol: Given equation is:

$\dfrac{\sqrt{2x+3}-14}{6}=-2$

$$\sqrt{2x+3}-14=-12$$
$$\sqrt{2x+3}=-12+14$$
$$\sqrt{2x+3}=2$$

Squaring both sides

$$2x+3=4$$
$$2x=1$$
$$x=\frac{1}{2}$$

Check: Put $x=\frac{1}{2}$ or $2x=1$ in given equation

$$\frac{\sqrt{1+3}-14}{6}=-2$$
$$\frac{\sqrt{4}-14}{6}=-2$$
$$\frac{2-14}{6}=-2$$
$$\frac{-12}{6}=-2$$
$$-2=-2$$

So, S.S is $\left\{\frac{1}{2}\right\}$

xv. $3\sqrt{2x}=2$

Sol: Given equation is:

$$3\sqrt{2x}=2$$

Squaring both sides

$$9(2x)=4$$
$$18x=4$$
$$x=\frac{2}{9}$$

Check: Put $x=\frac{2}{9}$ **in given equation**

$$3\sqrt{2(2/9)}=2$$
$$3\sqrt{4/9}=2$$
$$3(2/3)=2$$
$$2=2$$

So, S.S is $\left\{\frac{2}{9}\right\}$

xvi. $\sqrt{\frac{x+1}{2x+5}}=2$

Sol: Given equation is:

$$\sqrt{\frac{x+1}{2x+5}}=2$$

Squaring both sides

$$\frac{x+1}{2x+5}=4$$
$$8x+20=x+1$$
$$8x-x=1-20$$
$$7x=-19$$
$$x=-\frac{19}{7}$$

Check: Put $x=-\frac{19}{7}$ **in given equation**

$$\sqrt{\frac{\frac{-19}{7}+1}{2\left(\frac{-19}{7}\right)+5}}=2$$
$$\sqrt{\frac{\frac{-19+7}{7}}{\frac{-38+35}{7}}}=2$$
$$\sqrt{\frac{\frac{-12}{7}}{\frac{-3}{7}}}=2$$
$$\sqrt{\frac{12}{3}}=2$$
$$\sqrt{4}=2$$
$$2=2$$

So, S.S is $\left\{-\frac{19}{7}\right\}$

xvii. $\sqrt{\frac{x+8}{x-3}}=\sqrt{\frac{x-11}{x+2}}$

Sol: Given equation is:

$$\sqrt{\frac{x+8}{x-3}}=\sqrt{\frac{x-11}{x+2}}$$

Squaring both sides

$$\frac{x+8}{x-3}=\frac{x-11}{x+2}$$

$$(x+8)(x+2)=(x-11)(x-3)$$

$$x^2+10x+16=x^2-14x+33$$

$$10x+14x=33-16$$

$$24x=17$$

$$x=\frac{17}{24}$$

Check: Put $x=\frac{17}{24}$ in given equation

$$\sqrt{\frac{\frac{17}{24}+8}{\frac{17}{24}-3}}=\sqrt{\frac{\frac{17}{24}-11}{\frac{17}{24}+2}}$$

$$\sqrt{\frac{17+192}{17-72}}=\sqrt{\frac{17-264}{17+48}}$$

$$\sqrt{\frac{209}{-55}}=\sqrt{\frac{-247}{65}}$$

$$\sqrt{-\frac{209}{55}}=\sqrt{-\frac{247}{65}}$$

$$\sqrt{-3.8}=\sqrt{-3.8}$$

So, S.S. is $\left\{\frac{17}{24}\right\}$

xviii. $\sqrt{\frac{1}{2}(2x-1)}=\sqrt{\frac{2}{5}(x+1)}$

Sol: Given equation is:

$$\sqrt{\frac{1}{2}(2x-1)}=\sqrt{\frac{2}{5}(x+1)}$$

Squaring both sides

$$\frac{1}{2}(2x-1)=\frac{2}{5}(x+1)$$

$$5(2x-1)=4(x+1)$$

$$10x-5=4x+4$$

$$10x-4x=4\ 4+5$$

$$6x=9$$

$$x=\frac{3}{2}$$

Check: Put $x=\frac{3}{2}$ in given equation

$$\sqrt{\frac{1}{2}(3-1)}=\sqrt{\frac{1}{5}\left(\frac{3}{2}+1\right)}$$

$$\sqrt{\frac{2}{2}}=\sqrt{\frac{2}{5}+\left(\frac{3+2}{2}\right)}$$

$$\sqrt{1}=\sqrt{\frac{5}{5}}$$

$$\sqrt{1}=\sqrt{1}$$

$$1=1$$

So, S.S. is $\left\{\frac{3}{2}\right\}$

Exercise 1.7

Q. Find the solution set of following equations (when x, y, z $\in R$)

i. $|3x|=9$

Sol: Given equation is:

$$|3x|=9$$

$$3x=\pm 9$$

$\Rightarrow 3x=9$, $x=3$ | $\Rightarrow 3x=-9$, $x=-3$

So, S.S. is $\{3,-3\}$

ii. $\left|\frac{2x}{3}\right| = 4$

Sol: Given equation is: $\left|\frac{2x}{3}\right| = 4$

$\Rightarrow \quad \frac{2x}{3} = \pm 4$

$\Rightarrow \frac{2x}{3} = 4 \quad | \quad \Rightarrow \frac{2x}{3} = -4$

$2x = 12 \quad | \quad 2x = -12$

$x = 6 \quad | \quad x = -6$

So, S.S. is $\{6, -6\}$

iii. $\frac{|3x|}{2} = 9$

Sol: Given equation is:

$\frac{|3x|}{2} = 9$

$|3x| = 18$

$\Rightarrow \quad 3x = \pm 18$

$\Rightarrow 3x = 18 \quad | \quad \Rightarrow 3x = -18$

$x = 6 \quad | \quad x = -6$

So, S.S. is $\{-6, 6\}$

iv. $|2y - 3| = 7$

Sol: Given equation is:

$|2y - 3| = 7$

$\Rightarrow \quad 2y - 3 = \pm 7$

$\Rightarrow 2y - 3 = 7 \quad | \quad \Rightarrow 2y - 3 = -7$

$2y = 7 + 3 \quad | \quad 2y = -7 + 3$

$2y = 10 \quad | \quad 2y = -4$

$y = 5 \quad | \quad 2y = -\frac{4}{2} = -2$

So, S.S. is $\{-2, 5\}$

v. $|8(y-3)| = 16$

Sol: Given equation is:

$|8(y-3)| = 16$

$|8y - 24| = 16$

$8y - 24 = \pm 16$

$\Rightarrow 8y - 24 = 16 \quad | \quad \Rightarrow 8y - 24 = -16$

$8y = 16 + 24 \quad | \quad 8y = -16 + 24$

$8y = 40 \quad | \quad 8y = 8$

$y = 5 \quad | \quad y = 1$

So, S.S. is $\{1, 5\}$

vi. $|4x| + 5 = 3$

Sol: Given equation is:

$|4x| + 5 = 3$

$|4x| = 3 - 5$

$|4x| = -2$

Since the absolute value of non-zero integer is always positive.

So S.S. is { }

vii. $\frac{|2y+3|}{2} - 3 = 8$

Sol: Given equation is:

$\frac{|2y+3|}{2} - 3 = 8$

$\frac{|2y+3|}{2} = 8 + 3$

$\frac{|2y+3|}{2} = 11$

$|2y+3| = 22$

$\Rightarrow \quad 2y + 3 = \pm 22$

$\Rightarrow 2y + 3 = 22 \quad | \quad \Rightarrow 2y + 3 = -22$

$2y = 22 - 3 \quad | \quad 2y = -22 - 3$

$2y = 22 - 3 \quad | \quad 2y = -25$

$2y = 19 \quad | \quad y = -\frac{25}{2}$

$y = \frac{19}{2}$

So, S.S. is $\left\{\frac{19}{2}, -\frac{25}{2}\right\}$

viii. $|5z-3|+6=-3$

Sol: Given equation is:

$$|5z-3|+6=-3$$
$$|5z-3|=-3-6$$
$$|5z-3|=-9$$

Since the absolute value of non-zero integer is always positive.

So, S.S. is { }

ix. $\left|\frac{y+2}{3}\right|=1$

Sol: Given equation is:

$$\left|\frac{y+2}{3}\right|=1$$
$$\Rightarrow \quad \frac{y+2}{3}=\pm 1$$
$$y+2=\pm 3$$

$\Rightarrow\ y+2=3$

$y=1$

$\Rightarrow\ y+2=-3$

$y=-5$

So, S.S. is $\{-5, 1\}$

x. $\frac{|2x+1|}{5}=\frac{|4x-3|}{2}$

Sol: Given equation is:

$$\frac{|2x+1|}{5}=\frac{|4x-3|}{2}$$
$$\left|\frac{2x+1}{4x-3}\right|=\frac{5}{2}$$
$$\Rightarrow \quad \frac{2x+1}{4x-3}=\pm\frac{5}{2}$$

$\Rightarrow\ \frac{2x+1}{4x-3}=\frac{5}{2}$

$20x-15=4x+2$

$20x-4x=2+15$

$16=17$

$x=\frac{17}{16}$

$\Rightarrow\ \frac{2x+1}{4x-3}=-\frac{5}{2}$

$4x+2=-20x+15$

$20x+4x=15-2$

$24x=13$

$x=\frac{13}{24}$

So, S.S. is $\left\{\frac{17}{16}, \frac{13}{24}\right\}$

xi. $\left|\frac{x+6}{x-4}\right|=\frac{4}{3}$, $x \neq 4$

Sol: Given equation is:

$$\left|\frac{x+6}{x-4}\right|=\frac{4}{3}$$
$$\Rightarrow \quad \frac{x+6}{x-4}=\pm\frac{4}{3}$$

$\Rightarrow\ \frac{x+6}{x-4}=\frac{4}{3}$

$4x-16=3x+18$

$4x-3x=16+18$

$x=34$

$\Rightarrow\ \frac{x+6}{x-4}=-\frac{4}{3}$

$3x+18=-4x+16$

$3x+4x=16-18$

$7x=-2$

$x=-\frac{2}{7}$

So, S.S. is $\left\{34, -\frac{2}{7}\right\}$

xii. $\left|\frac{3-5y}{4}\right|-\frac{2}{3}=\frac{1}{3}$

Sol: Given equation is:

$$\left|\frac{3-5y}{4}\right|=\frac{1}{3}+\frac{2}{3}$$
$$\left|\frac{3-5y}{4}\right|=1$$
$$\Rightarrow \quad \frac{3-5y}{4}=\pm 1$$

$\Rightarrow \frac{3-5y}{4}=1$

$3-5y=4$

$3-4=5y$

$5y=-1$

$y=-\frac{1}{5}$

$\Rightarrow \frac{3-5y}{4}=-1$

$3-5y=-4$

$3+4=5y$

$5y=7$

$y=\frac{7}{5}$

So, S.S. is $\left\{-\frac{1}{5},\frac{7}{5}\right\}$

xiii. $-12=3-|3y+1|$

Sol: Given equation is:

$$-12=3-|3y+1|$$
$$|3y+1|=3+12$$
$$|3y+1|=15$$
$$\Rightarrow \quad 3y+1=\pm 15$$

$\Rightarrow 3y+1=15$

$3y=15-1$

$3y=14$

$y=\frac{14}{3}$

$\Rightarrow 3y+1=-15$

$3y=-15-1$

$3y=-16$

$y=-\frac{16}{3}$

So, S.S. is $\left\{\frac{14}{3},-\frac{16}{3}\right\}$

xiv. $|x+2|-3=5-|x+2|$

Sol: Given equation is:

$$|x+2|-3=5-|x+2|$$
$$|x+2|+|x+2|=5+3$$
$$2|x+2|=8$$
$$|x+2|=4$$
$$\Rightarrow \quad x+2=\pm 4$$

$\Rightarrow x+2=4$

$x=4-2$

$x=2$

$\Rightarrow x+2=-4$

$x=-4-2$

$x=-6$

So, S.S. is $\{-6, 2\}$

xv. $|x+2|=7$

Sol: Given equation is:

$$|x+2|=7$$
$$\Rightarrow \quad x+2=\pm 7$$

$\Rightarrow x+2=7$

$x=7-2$

$x=5$

$\Rightarrow x+2=-7$

$x=-7-2$

$x=-9$

So, S.S. is $\{5, -9\}$

Exercise 1.8

Q.1 Find the solution set of following equations.

i. $4x-3<9$ $(x \in W)$

Sol: Given in equation is:

$$4x-3<9$$
$$4x-3+3<9+3$$
$$4x<9+3$$
$$4x<12$$
$$x<3$$

As $x \in W$

So, S.S. is $\{0, 1, 2\}$

ii. $4y-3>2+3y$ $(y \in N)$

Sol: Given in equation is:

$$4y-3+3>2+3+3y$$
$$4y>5+3y$$
$$4y-3y>5+3y-3y$$
$$y>5$$

Since $x \in N$

So, S.S is $\{6, 7, 8, \ldots\ldots\ldots\ldots\}$

iii. $2+2x<5x-3$ $(x \in Q)$

Sol: Given in equation is:

$2+2x<5x-3$
$2x-5x<-3-2$
$-3x<-5$

Dividing both sides by – 3

$x>\frac{5}{3}$

Since $x \in Q$

So, S.S. is $\left\{x \mid x \in Q \wedge x>\frac{5}{3}\right\}$

iv. $-5y-6>17$ $(y \in R)$

Sol: Given in equation is:

$-5y-6>17$

$-5y-6+6>17+6$

(Dividing by –5)

$-5y>23$

$-5y>23$

$y<-\frac{23}{5}$

Since $x \in R$

So, S.S is $\left\{y \mid y \in R \wedge y<-\frac{23}{5}\right\}$

v. $2x+7<5x-2$ $(x \in R)$

Sol: Given in equation is:

$2x+7<5x-2$
$2x+7-7<5x-2-7$
$2x-5x<5x-5x-9$
$-3x<-9$
$x>3$ (Multiplying by –1)

Since $x \in R$

So, S.S is $\{x \mid x \in R \wedge x>3\}$

vi. $4y-3>2y+5$ $(y \in R)$

Sol: Given in equation is:

$4y-3>2y+5$
$4y-3+3>2y+5+3$
$4y>2y+8$
$4y-2y>2y-2y+8$
$2y>8$ (*Dividing by* 2)
$y>4$

Since $y \in R$

So, S.S is $\{y \mid y \in R \wedge y>4\}$

vii. $\frac{2x-1}{3}<\frac{2x+3}{2}$, $(x \in R)$

Sol: Given in equation is:

$\frac{2x-1}{3}<\frac{2x+3}{2}$
$4x-2<6x+9$

$4x-2+2<6x+9+2$
$4x<6x+11$

$4x-6x<11$
$-2x<11$
$x>-\frac{11}{2}$

Since $x \in R$

So, S.S is $\left\{x \mid x \in R \wedge x>-\frac{11}{2}\right\}$

viii. $3(y+1)>5(3-y)$, $(x \in R)$

Sol: Given in equation is:

$3(y+1)>5(3-y)$
$3y+3-3>15-3-5y$
$3y>12-5y$
$3y+5y>12-5y+5y$
$8y>12$ (*Dividing by* 8)
$y>\frac{3}{2}$

Since $y \in R$

So, S.S is $\left\{y \mid y \in R \wedge y>\frac{3}{2}\right\}$

Q.2 Find the solution set of the following equations and represent their solutions on number line.

i. $2x<8$ $(x \in W)$

Sol: Given in equation is:

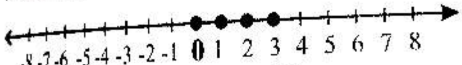
$2x<8$

$\Rightarrow$ $x<4$

Since $x \in W$

So, S.S is $\{0, 1, 2, 3\}$

Now representation of solution on number line is



ii. $5 - 7x < 40 \quad (x \in Z)$

Sol: Given in equation is:

$-5+5-7x<40-5$

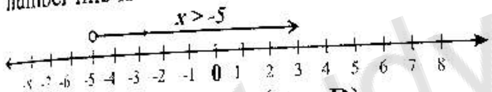
$-7x<35$

$x>-5 \qquad$ *(Dividing by -7)*

Since $x \in z$

So, S.S is $\{x \mid x \in Z \wedge x > -5\}$

Now representation of solution on number line is



iii. $5x + 7 > 12 \quad (x \in R)$

Sol: Given in equation is:

$5x+7>12$

$5x+7-7>12-7$

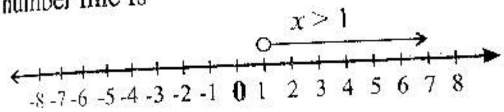
$5x>5 \qquad$ *(Dividing by 5)*

$x>1$

Since $x \in R$

So, S.S is $\{x \mid x \in R \wedge x > 1\}$

Now representation of solution on number line is



iv. $3y + 7 < -2y - 3 \quad (y \in R)$

Sol: Given in equation is:

$3y+7<-2y-3$

$3y+7-7<-2y-3-7$

$3y<-2y+2y-10$

$3y+2y<-2y+2y-10$

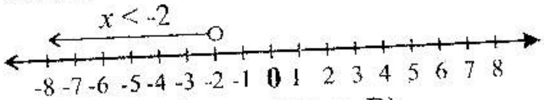
$5y<-10 \qquad$ *(Dividing by 5)*

$y<-2$

Since $y \in R$

So, S.S is $\{y \mid y \in R \wedge y < -2\}$

Now representation of solution on number line is



v. $2y + 6 > y + 4 \ (x \in R)$

Sol: Given in equation is:

$2y+6>y+4$

$2y+6-6>y+4-6$

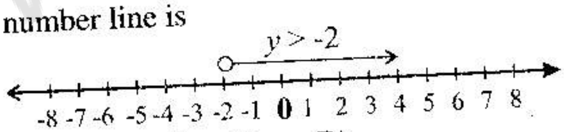
$2y-y>y-y-2$

$y>-2$

Since $y \in R$

So, S.S is $\{y \mid y \in R \wedge y > -2\}$

Now representation of solution on number line is



vi. $4z - 3 > 2z - 9 (z \in R)$

Sol: Given in equation is:

$4z-3>2z-9$

$4z-3+3>2z-9+3$

$4z>2z-6$

$4z-2z>2z-2z-6$

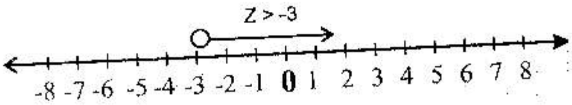
$2z>-6 \qquad$ *(Dividing by 2)*

$z>-3$

Since $z \in R$

So S.S is $\{z \mid z \in R \wedge z > -3\}$

Now representation of solution on number line is



vii. $2x + 5 < 15$ $(x \in N)$

Sol: Given in equation is:

$2x+5<15$

$2x+5-5<15-5$

$2x<10$ *(Dividing by 2)*

$x<5$

Since $x \in N$

So, S.S is $\{1, 2, 3, 4\}$

Now representation of solution on number line is

viii. $2y + 3 > y + 4$ $(y \in N)$

Sol: Given in equation is:

$2y+3>y+4$

$2y+3-3>y+4-3$

$2y>y+1$

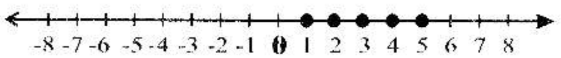
$2y-y>y-y+1$

$y>1$

Since $y \in N$

So, S.S is $\{y \mid y \in N \wedge y>1\}$ or $\{2,3,4,\ldots\}$

Now representation of solution on number line is



ix. $3x + 5 < -2x - 15$ $(x \in R)$

Sol: Given in equation is:

$3x+5<-2x-15$

$3x+5-5<-2x-15-5$

$3x<-2x-20$

$3x+2x<-2x+2x-20$

$5x<-20$ *(Dividing by 5)*

$x<-4$

Since $x \in R$

So, S.S is $\{x \mid x \in R \wedge x<-4\}$

Now representation of solution on number line is

x. $3x + 5 > 5x + 1$ $(x \in R)$

Sol: Given in equation is:

$3x+5>5x+1$

$3x+5-5>5x+1-5$

$3x>5x-4$

$3x-5x>5x-5x-5x-4$

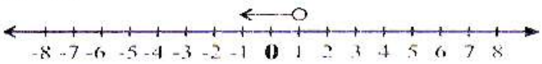
$-2x>-4$ *(Dividing by -2)*

$x<2$

Since $x \in R$

So, S.S is $\{x \mid x \in R \wedge x<2\}$

Now representation of solution on number line is



Exercise 1.9

Q.1 Find the solution set of following:

i. $6x + 4 \le 13$ $(x \in N)$

Sol: Given

$3x+4\le 13$

$3x+4-4\le 13-4$

$3x\le 13-4$

$3x\le 9$

$x\le 3$

Since $x \in N$

So, S.S. is $\{1, 2, 3\}$

ii. $2x + 7 \le 15$ $(x \in W)$

Sol: Given

$2x+7\le 15$

$2x+7-7\le 15-7$

$2x\le 15-7$

$2x+7\leq 15-7$

$2x\leq 8$ *(Dividing by 2)*

$x\leq 4$

Since $x\in W$

So, S.S. is $\{0, 1, 2, 3, 4\}$

iii. $4x+4\leq 20$ $(x\in W)$

Sol: Given

$4x+4\leq 20$

$4x+4-4\leq 20-4$

$4x\leq 16$ *(Dividing by 4)*

$x\leq 4$

Since $x\in W$

So, S.S. is $\{0, 1, 2, 3, 4\}$

iv. $4-5x\leq 21$ $(x\in N)$

Sol: Given

$4-5x\leq -21$

$-4+4-5x\leq -21-4$

$-5x\leq -25$ *(Dividing by −5)*

$x\geq 5$

Since $x\in N$

So, S.S. is $\{5, 6, 7, 8, ...\}$

Q.2 Find the solution set of the following (when x, y ∈ R)

i. $2x+8\leq 18$

Sol: Given

$2x+8\leq 18$

$2x+8-8\leq 18-8$

$2x\leq 10$ *(Dividing by 5)*

$x\leq 5$

Since $x\in R$

So, S.S. is $\{x\mid x\in R\wedge\leq 5\}$

ii. $\frac{x}{3}\geq 6+\frac{x}{2}$

Sol: Given

$\frac{x}{3}\geq 6+\frac{x}{2}$

Multiplying throughout by 6

$2x\geq 36+3x$

$2x-3x\geq 36+3x-3x$

$2x-3x\geq 36$

$-x\geq 36$ *(Multiplying by −1)*

$x\leq -36$

Since $x\in R$

So, S.S. is $\{x\mid x\in R\wedge\leq -36\}$

iii. $5-x\leq 8$

Sol: Given

$5-x\leq 8$

$-5+5-x\leq 8-5$

$-x\leq 3$ ***(Multiplying by −1)***

$x\geq -3$

Since $x\in R$

So, S.S. is $\{x\mid x\in R\wedge x\geq -3\}$

iv. $\frac{6y}{5}-\frac{2}{3}\leq\frac{1}{2}y-\frac{3}{4}$

Sol: Given

$\frac{6y}{5}-\frac{2}{3}\leq\frac{1}{2}y-\frac{3}{4}$

$\frac{6y}{5}-\frac{y}{2}\leq-\frac{3}{4}+\frac{2}{3}$

$\frac{12y-5y}{10}\leq\frac{-9+8}{12}$

$\frac{7y}{10}\leq-\frac{1}{12}$

Multiplying throughout by 60

$42y\leq -5$

$y\leq -\frac{5}{42}$

Since $y\in R$

So, S.S. is $\left\{y\mid y\in R\wedge y\leq -\frac{5}{42}\right\}$

v. $\frac{2y+5}{2}\leq\frac{7y+17}{2}$

Sol: Given

$$\frac{2y+5}{2} \le \frac{7y+17}{2}$$

Multiplying throughout by 2

$2y+5 \le 7y+17$

$2y+5-5 \le 7y+17-5$

$2y \le 7y+12$

$2y-7y \le 7y-7y+12$

$-5y \le 12$

$y \ge -\frac{12}{5}$

Since $y \in R$

So, S.S. is $\left\{y \mid y \in R \wedge y \ge -\frac{12}{5}\right\}$

vi. $|2x+1| < 4$

Sol: Given

$|2x+1| < 4$

$-4 < 2x+1 < 4$

$\Rightarrow 2x+1 > -4$ *or* $2x+1 < 4$

$\Rightarrow 2x+1-1 > -4-1$ *or* $2x+1-1 < 4-1$

$\Rightarrow 2x > -5$ *or* $x < 3$

$\therefore x > \frac{-5}{2}$ *or* $x < \frac{3}{2}$ Since

$x \in R$

So, S.S. is $\left\{x \mid x \in R \wedge -\frac{5}{2} < x < \frac{3}{2}\right\}$

vii. $|3x-2| > 7$

Sol: Given

$|3x-2| > 7$

Here we have

$\Rightarrow 3x-2 > 7$ *or* $3x-2 < -7$

$3x-2+2 > 7+2$ *or* $3x-2+2 < -7+2$

$3x > 7+2$ *or* $3x < -7+2$

$3x > 9$ *or* $3x < -5$

$x > 3$ *or* $x < -\frac{5}{3}$

Since $x \in R$

So, S.S. is $\left\{x \mid x \in R \wedge x > 3 \vee x < \frac{-5}{3}\right\}$

viii. $3 \le 2x+1 \le 7$

Sol: Given

$3 \le 2x+1 \le 7$

$3 \le 2x+1 \le 7$

$3-1 \le 2x+1-1 \le 7-1$

$2 \le 2x \le 6$

Dividing by 2

$1 \le x \le 3$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge 1 \le x \le 3\}$

ix. $3 \le 2x-3 \le 5$

Sol: Given

$3 \le 2x-3 \le 5$

$\Rightarrow 3 \le 2x-3 \le$

$3+3 \le 2x-3+3 \le 5+3$

$6 \le 2x \le 8$

Dividing by 2

$3 \le x \le 4$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge 3 \le x \le 4\}$

Q.3 Find the solution set of the following and represent it on number line (when x, y $\in$ R).

i. $2x+1 \le 5$

Sol: Given

$2x+1 \le 5$

$2x+1-1 \le 5-1$

$2x \le 4$

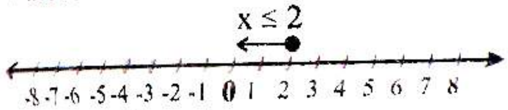
$2x \le 4$

$x \le 2$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge x \le 2\}$

Now representation of solution on number line is



ii. $2x + 6 \geq -4$

Sol: Given

$2x+6 \geq -4$

$2x+6-6 \geq -4-6$

$2x \geq -10$

$x \geq -5$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge x \geq -5\}$

Now representation of solution on number line is

iii. $5y - 2 \leq \frac{1}{2}$

Sol: Given

$5y-2 \leq \frac{1}{2}$

$5y-2+2 \leq \frac{1}{2}+2$

$5y \leq \frac{5}{2}$

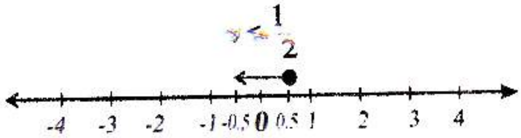
$y \leq \frac{5}{10}$ *(Dividing by 2)*

$y \leq \frac{1}{2}$

Since $y \in R$

So, S.S. is $\left\{y \mid y \in R \wedge y \leq \frac{1}{2}\right\}$

Now representation of solution on number line is



iv. ***x > 1 and x < 6***

Sol: Given

$x > 1$ *and* $x < 6$

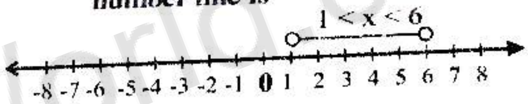
or $1 < x$ $x < 6$

$\Rightarrow$ $1 < x < 6$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge 1 < x < 6\}$

Now representation of solution on number line is



v. $\frac{2x-5}{3} \leq 3$

Sol: Given

$\frac{2x-5}{3} \leq 3$

$2x-5 \leq 9$

$2x-5+5 \leq 9+5$

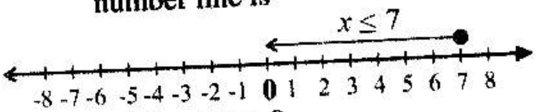
$2x \leq 14$

$x \leq 7$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge x \leq 7\}$

Now representation of solution on number line is



vi. $y \leq 7$ and $y > 0$

Sol: Given

$y \leq 7$ *and* $y > 0$

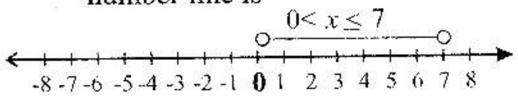
or $y \leq 7$ $0 < y$

$\Rightarrow$ $0 < y \leq 7$

Since $y \in R$

So, S.S. is $\{y \mid y \in R \wedge 0 < y \leq 7\}$

Now representation of solution on number line is



vii. $x - 2 > -5$ and $x + 3 < 13$

Sol: Given

$x-2>-5 \qquad and \quad x+3<13$

$\Rightarrow x-2+2>-5+2 \qquad and \quad x+3-3<13-3$

$\Rightarrow x>-5+2 \qquad and \quad x<13-3$

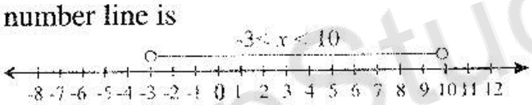
$x>-3 \qquad and \quad x<10$

$-3<x \qquad and \quad x<10$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge -3 < x < 10\}$

Now representation of solution on number line is



viii. $-3 < 2x + 1 < 5$

Sol: Given

$-3<2x+1<5$

$-3-1<2x+1-1<5-1$

$-4<2x<4$

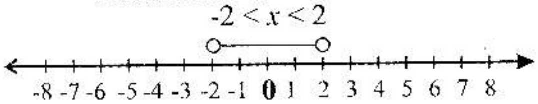
Dividing by 2

$-2<x<2$

Since $x \in R$

So, S.S. is $\{x \mid x \in R \wedge -2 < x < 2\}$

Now representation of solution on number line is



ix. $-7 \leq 2y - 3 \leq 7$

Sol: Given

$-7 \leq 2y-3 \leq 7$

$-7+3 \leq 2y-2+3 \leq 7+3$

$-4 \leq 2y \leq 10$

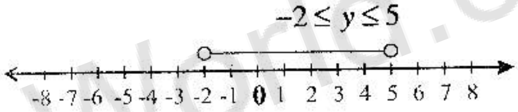
Dividing by 2

$-2 \leq y \leq 5$

Since $x \in R$

So, S.S. is $\{y \mid y \in R \wedge -2 \leq y \leq 5\}$

Now representation of solution on number line is



x. $-8 \leq 7y - 1 \leq 13$

Sol: Given

$-8 \leq 7y-1 \leq 13$

$-8+1 \leq 7y-1+1 \leq 13+1$

$-7 \leq 7y \leq 14$

Dividing by 7

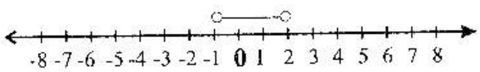
$-1 \leq y \leq 2$

Since $y \in R$

So, S.S. is $\{y \mid y \in R \wedge -1 \leq y \leq 2\}$

Now representation of solution on number line is

$-1 \leq y \leq 2$



Exercise 1.10

Q.1 Find the solution set of following equations.

i. $3x(x-1)=0$

Sol: Given equation is:

$3x(x-1)=0$

Dividing both sides by 3

$x(x-1)=0$

$\Rightarrow \quad x=0 \quad or \quad x-1=0$

Hence

$x=0 \quad or \quad x=1$

So, S.S. is $\{0, 1\}$

ii. $3z(z+1)=0$

Sol: Given equation is:

$3z(z+1)=0$

Dividing both sides by 3

$z(z+1)=0$

$\Rightarrow \quad z=0 \quad or \quad z+1=0$

Hence

$z=0 \quad or \quad z=-1$

So, S.S. is $\{0, -1\}$

iii. $(y+5)(y-9)=0$

Sol: Given equation is:

$(y+5)(y-9)=0$

$(y+5)(y-9)=0$

$\Rightarrow \quad y+5=0 \quad or \quad y-9=0$

Hence

$y=-5 \quad or \quad y=9$

So, S.S. is $\{-5, 9\}$

iv. $(2z-1)(3z+5)=0$

Sol: Given equation is:

$(2z-1)(3z+5)=0$

$\Rightarrow \quad 2z-1=0 \quad or \quad 3z+5=0$

Hence

$2z=1 \quad or \quad 3z=-5$

$z=\frac{1}{2} \quad or \quad z=-\frac{5}{3}$

So S.S. is $\left\{\frac{1}{2}, -\frac{5}{3}\right\}$

Q.2 Solve:

i. $3x^2-5x-4(x^2-3x)=6$

Sol: Given equation is:

$3x^2-5x-4x^2+12x=6$

$3x^2-4x^2-5x+12x-6=0$

$-x^2+7x-6=0$

$x^2-7x+6=0$

$x^2-6x-x+6=0$

$x(x-6)-1(x-6)=0$

$(x-6)(x-1)=0$

$\Rightarrow \quad x-6=0 \quad or \quad x-1=0$

Hence

$x=6 \quad or \quad x=1$

So, S.S. is $\{6, 1\}$

ii. $6x-6\left(3x^2-\frac{x-1}{2}\right)=-5$

Sol: Given equation is:

$6x-6\left(3x^2-\frac{x-1}{2}\right)=-5$

$6x-18x^2+3(x-1)=-5$

$6x-18x^2+3x-3+5=0$

$-18x^2+9x+2=0$

$18x^2-9x-2=0$

$18x^2-12x+3x-2=0$

$6x(3x-2)+1(3x-2)=0$

$(6x+1)(3x-2)=0$

$\Rightarrow 6x+1=0 \quad \text{or} \quad 3x-2=0$

$\Rightarrow 6x=-1 \quad \text{or} \quad 3x=2$

$x = -\frac{1}{6}$ or $x = \frac{2}{3}$

So, S.S. is $\left\{-\frac{1}{6}, \frac{2}{3}\right\}$

iii. $(x-1)^2 + (2x+3)^2 = -10x - 10$

Sol: Given equation is:

$(x-1)^2 + (2x+3)^2 = -10x - 10$

$x^2 - 2x + 1 + 4x^2 + 12x + 9 + 10x + 10 = 0$

$5x^2 + 20x + 20 = 0$

$x^2 + 4x + 4 = 0$

$(x+2)^2 = 0$

Taking square root of both sides

$x + 2 = 0$

$x = -2$

So, S.S. is $\{-2\}$

iv. $(x-2)^2 = -5x + 10$

Sol: Given equation is:

$(x-2)^2 = -5x + 10$

$x^2 - 4x + 4 + 5x - 10 = 0$

$x^2 + x - 6 = 0$

$x^2 + 3x - 2x - 6 = 0$

$x(x+3) - 2(x+3) = 0$

$(x+3)(x-2) = 0$

$\Rightarrow$

$x + 3 = 0$ or $x - 2 = 0$

$x = -3$ or $x = 2$

So, S.S. is $\{-3, 2\}$

v. $3x^2 + 1 = (x^2 + 2) - x$

Sol: Given equation is:

$3x^2 + 1 = x^2 + 2 - x$

$3x^2 + 1 - x^2 - 2 + x = 0$

$2x^2 + x - 1 = 0$

$2x^2 + 2x - x - 1 = 0$

$2x(x+1) - 1(x+1) = 0$

$(x+1)(2x-1) = 0$

$\Rightarrow$ $x + 1 = 0$ or $2x - 1 = 0$

$x = -1$ or $x = \frac{1}{2}$

So, S.S. is $\left\{-1, \frac{1}{2}\right\}$

vi. $(2x+1)^2 = 6x + 7$

Sol: Given equation is:

$(2x+1)^2 = 6x + 7$

$4x^2 + 4x - 6x + 1 - 7 = 0$

$4x^2 - 2x - 6 = 0$

$2x^2 - x - 3 = 0$

$2x^2 - 3x + 2x - 3 = 0$

$x(2x-3) + 1(2x-3) = 0$

$(2x-3)(x+1) = 0$

$2x - 3 = 0$ or $x + 1 = 0$

$2x = 3$ or $x = -1$

$x = 3/2$ or $x = -1$

So, S.S is $\{-1, 3/2\}$

Q.3 Solve the following equations by factorization.

i. $x^2 - 7x + 10 = 0$

Sol: Given equation is:

$x^2 - 2x - 5x + 10 = 0$

$x(x-2) - 5(x-2) = 0$

$(x-2)(x-5) = 0$

$\Rightarrow x - 2 = 0$ or $x - 5 = 0$

$x = 2$ or $x = 5$

So, S.S is $\{2, 5\}$

ii. $9x^2 - 6x - 8 = 0$

Sol: Given equation is:

$9x^2 - 6x - 8 = 0$

$9x^2 - 12x + 6x - 8 = 0$

$3x(3x-4) + 2(3x-4) = 0$

$(3x-4)(3x+2) = 0$

$\Rightarrow \quad 3x-4=0 \quad or \quad 3x+2=0$

$\Rightarrow \quad 3x=4 \quad or \quad 3x=-2$

$x=\frac{4}{3} \quad or \quad x=-\frac{2}{3}$

So, S.S is $\left\{\frac{4}{3},-\frac{2}{3}\right\}$

iii. $\mathbf{2y^2+5y-3=0}$

Sol: Given equation is: $2y^2+5y-3=0$

$2y^2+6y-y-3=0$

$2y(y+3)-1(y+3)=0$

$(y+3)(2y-1)=0$

$\Rightarrow \quad y+3=0 \quad or \quad 2y-1=0$

$y=-3 \quad or \quad 2y=1$

$y=-3 \quad or \quad y=1/2$

So, S.S. is $\left\{-3,\frac{1}{2}\right\}$

iv. $\mathbf{2(z^2-15)=11z}$

Sol: Given equation is: $2(z^2-15)=11z$

$2z^2-30-11z=0$

$2z^2-11z-30=0$

$2z^2-15z+4z-30=0$

$z(2z-15)+2(2z-15)=0$

$(2z-15)(z+2)=0$

$\Rightarrow \quad 2z-15=0 \quad or \quad z+2=0$

$2z=15 \quad or \quad z=-2$

$z=\frac{15}{2} \quad or \quad z=-2$

So, S.S is $\left\{\frac{15}{2},-2\right\}$

v. $\mathbf{5s^2-12=17s}$

Sol: Given equation is: $5s^2-12=17s$

$5s^2-17s-12=0$

$5s^2-20s+3s-12=0$

$5s(s-4)+3(s-4)=0$

$(s-4)(5s+3)=0$

$\Rightarrow \quad s-4=0 \quad or \quad (5s+3=0)$

$s=4 \quad or \quad 5s=-3$

$s=4 \quad or \quad s=-3/5$

S.S. is $\left\{4,-\frac{3}{5}\right\}$

vi. $\mathbf{-7t=2t^2+6}$

Sol: Given equation is: $-7t=2t^2+6$

$2t^2+6=-7t$

$2t^2+7t+6=0$

$2t^2+4t+3t+6=0$

$2t(t+2)+3(t+2)=0$

$(t+2)(2t+3)=0$

$\Rightarrow \quad t+2=0 \quad or \quad 2t+3=0$

$t=-2 \quad or \quad t=-\frac{3}{2}$

So, S.S is $=\left\{-2,\frac{-3}{5}\right\}$

vii. $\mathbf{x^2-8px+12p^2=0}$

Sol: Given equation is: $x^2-8px+12p^2=0$

$x^2-6px-2px+12p^2=0$

$x(x-6p)-2p(x-6p)=0$

$(x-6p)(x-2p)=0$

$\Rightarrow \quad x-6p=0 \quad or \quad x-2p=0$

$x=6p \quad or \quad x=2p$

So, S.S. is $\{6p, 2p\}$

viii. $\mathbf{12x^2-qx-13q^2=0}$

Sol: Given equation is:

$12x^2-qx-13q^2=0$

$12x^2+12qx-13qx-13q^2=0$

$12x(x+q)-13q(x+q)=0$

$(x+q)(12x-13q)=0$

$\Rightarrow \quad x+q=0 \quad or \quad 12x-13q=0$

$x-q \quad or \quad x=\frac{13}{12}q$

So, S.S. is $\left\{-q, \frac{13}{12}q\right\}$

ix. $\mathbf{4x^2 + 2x - 6 = 0}$

Sol: Given equation is: $4x^2 + 2x - 6 = 0$

Dividing both sides by 2

$$2x^2 + x - 3 = 0$$
$$2x^2 + 3x - 2x - 3 = 0$$
$$x(2x+3) - 1(2x+3) = 0$$
$$\Rightarrow \quad x - 1 = 0 \quad or \quad 2x + 3 = 0$$
$$x = 1 \quad or \quad x = -3/2$$

So, S.S. is $\left\{-\frac{3}{2}, 1\right\}$.

x. $\mathbf{2y^2 - 3y - 14 = 0}$

Sol: Given equation is: $2y^2 - 3y - 14 = 0$

$$2y^2 - 7y + 4y - 14 = 0$$
$$y(2y-7) + 2(2y-7) = 0$$
$$(2y-7)(y+2) = 0$$
$$\Rightarrow \quad 2y - 7 = 0 \quad or \quad y + 2 = 0$$
$$2y = 7 \quad or \quad y = -2$$
$$y = \frac{7}{2} \quad or \quad y = -2$$

So, S.S. is $\left\{\frac{7}{2}, -2\right\}$

xi. $\frac{1}{2}x^2 - \frac{3}{2}x - 2 = 0$

Sol: Given equation is: $\frac{1}{2}x^2 - \frac{3}{2}x - 2 = 0$

Multiplying both sides by 2

$$x^2 - 3x - 4 = 0$$
$$x^2 - 4x + x - 4 = 0$$
$$x(x-4) + 1(x-4) = 0$$
$$(x-4)(x+1) = 0$$
$$\Rightarrow \quad x - 4 = 0 \quad or \quad x + 1 = 0$$
$$x = 4 \quad or \quad x = -1$$

So, S.S. is $\{4, -1\}$

xii. $\frac{1}{3}y^2 - 2y + 3 = 0$

Sol: Given equation is:

$$\frac{1}{3}y^2 - 2y + 3 = 0$$

Multiplying both sides by 3

$$y^2 - 6y + 9 = 0$$
$$y^2 - 3y - 3y + 9 = 0$$
$$y(y-3) - 3(y-3) = 0$$
$$(y-2)(y-3) = 0$$
$$\Rightarrow \quad y - 3 = 0 \quad or \quad y - 3 = 0$$
$$y = 3 \quad or \quad y = 3$$

So, S.S is $\{3\}$

Exercise 1.11

Q.1 Solve

i. $(x - 2)^2 = 9$

Sol: Given equation is:

$$(x-2)^2 = 9$$

$(x-2)^2 = (3)^2$ By taking square root both sides

$$\Rightarrow \quad x - 2 = \pm 3$$
$$x = 2 \pm 3$$
$$x = 2 + 3 \quad or \quad x = 2 - 3$$
$$x = 5 \quad or \quad x = -1$$

So, S.S. is $\{5, -1\}$

ii. $(z + 3)^2 = 4$

Sol: Given equation is:

$(z+3)^2=4$

$(z+3)^2=(2)^2$ By taking square root both sides.

$z+3=\pm 2$

$z=-3\pm 2$

$z=-3+2$ or $x=-3-2$

$z=-1$ or $x=-5$

So, S.S. is $\{-1,-5\}$

iii. $(2y+1)^2=36$

Sol: Given equation is:

$(2y+1)^2=36$

$(2y+1)^2=(6)^2$ By taking square root both sides.

$\Rightarrow$ $2y+1=\pm 6$

$2y=-1\pm 6$

$2y=-1+6$ or $y=-1-6$

$2y=5$ or $y=-7$

or $y=\frac{5}{2}$ or $y=-\frac{7}{2}$

So, S.S. is $\left\{\frac{5}{2},-\frac{7}{2}\right\}$

iv. $\left(z+\frac{5}{3}\right)^2=7$

Sol: Given equation is:

$$\left(z+\frac{5}{3}\right)^2=7$$

or $\left(z+\frac{5}{3}\right)^2=\left(\sqrt{7}\right)^2$ By taking square root both sides.

$\Rightarrow$ $z+\frac{5}{3}=\pm\sqrt{7}$

or $z=-\frac{5}{3}\pm\sqrt{7}$

So, S.S. is $\left\{-\frac{5}{3}\pm\sqrt{7}\right\}$

v. $(s+1)^2=5$

Sol: Given equation is:

$(s+1)^2=5$

$(s+1)^2=\left(\sqrt{5}\right)^2$

$s+1=\pm\sqrt{5}$

or $s=-1\pm\sqrt{5}$

So S.S is $\left\{1\pm\sqrt{5}\right\}$

vi. $\left(u-\frac{3}{2}\right)^2=9$

$\left(u-\frac{3}{2}\right)^2 = 9$

$\left(u-\frac{3}{2}\right)^2 = (3)^2$

$u-\frac{3}{2} = \pm 3$

$u = \frac{3}{2}\pm 3$

$= \frac{3\pm 6}{2}$

$u = \frac{3+6}{2}$ or $u=\frac{3-6}{2}$

$u = \frac{9}{2}$ or $u=-\frac{3}{2}$

So, S.S. is $\left\{\frac{9}{2},-\frac{3}{2}\right\}$

Q.2 Solve by completing square method.

i. $x^2-10x-171=0$

Sol: Given equation is:

$x^2-10x-171=0$

$x^2-10x=171$

Adding $(5)^2$ on both sides

$$x^2-10x+(5)^2 = 171+(5)^2$$
$$(x-5)^2 = 171+25$$
$$(x-5)^2 = 196$$
$$(x-5)^2=(14)^2 \quad (\textit{Taking Sqaure root})$$
$$\Rightarrow x-5 = \pm 14$$
$$x = 5\pm 14$$
$$x = 5+14 \quad or \quad x=5-14$$
$$x = 19 \quad or \quad x=-9$$

So, S.S is $\{19, -9\}$

ii. $\mathbf{x^2 + 4x = 0}$

Sol: Given equation is:

$x^2 + 4x = 0$

Adding $(2)^2$ on both sides

$$x^2+4x+(2)^2 = 0+(2)^2$$
$$(x+2)^2 = (2)^2$$
$$x+2 = \pm 2$$
$$x+2 = 2 \quad or \quad x+2 = -2$$
$$x = -2+2 \quad or \quad x = -2-2$$
$$x = 0 \quad or \quad x = -4$$

So, S.S. is $\{0, -4\}$

iii. $\mathbf{4y^2 + 12y = 16}$

Sol: Given equation is:

$4y^2 + 12y = 16$

Dividing both sides by 4

$y^2+3y=4$

Adding $\left(\frac{3}{2}\right)^2$ on both sides

$$y^2+3y+\left(\frac{3}{2}\right)^2=4+\left(\frac{3}{2}\right)^2$$
$$\left(y+\frac{3}{2}\right)^2 = 4+\frac{9}{4}$$
$$= \frac{16+9}{4}$$
$$= \frac{25}{4}$$
$$\left(y+\frac{3}{2}\right)^2 = \left(\frac{5}{2}\right)^2$$

(By taking square root)

$$y+\frac{3}{2} = \pm\frac{5}{2}$$
$$y = -\frac{3}{2}\pm\frac{5}{2}$$
$$y = \frac{-3}{2}+\frac{5}{2} \quad or \quad y = \frac{-3}{2}-\frac{5}{2}$$
$$y = \frac{-3+5}{2} \quad or \quad y = \frac{-3-5}{2}$$
$$y = 1 \quad or \quad y = -4$$

So, S.S is $\{1, -4\}$

iv. $\mathbf{z^2 = 17z - 52}$

Sol: Given equation is:

$z^2=17z-52$

$z^2-17z=-52$

Adding $\left(\frac{17}{2}\right)^2$ on both sides

$$z^2-17z+\left(\frac{17}{2}\right)^2 = -52+\left(\frac{17}{2}\right)^2$$
$$\left(z-\frac{17}{2}\right)^2 = -52+\left(\frac{17}{2}\right)^2$$
$$= -52+\frac{289}{4}$$
$$= \frac{-208+289}{4}$$

$$= \frac{81}{4}$$

$$\left(z - \frac{17}{2}\right)^2 = \left(\frac{9}{2}\right)^2$$

(By Taking Square Root)

$$z - \frac{17}{2} = \pm\frac{9}{2}$$

$$z = \frac{17}{2} \pm \frac{9}{2}$$

$$= \frac{17 \pm 9}{2}$$

$$z = \frac{17}{2} + \frac{9}{2} \quad or \quad z = \frac{17-9}{2}$$

$$z = \frac{17+9}{2} \quad or \quad z = \frac{17-9}{2}$$

$$z = \frac{26}{2} \quad or \quad z = \frac{8}{2}$$

So, S.S is {4, 13}

v. $4z^2 - z - \frac{1}{2} = 0$

Sol: Given equation is:

$$4z^2 - z - \frac{1}{2} = 0$$

or $4z^2 - z = \frac{1}{2}$

Dividing both sides by 4

$$z^2 - \frac{1}{4}z = \frac{1}{8}$$

Adding $\left(\frac{1}{8}\right)^2$ on both sides

$$z^2 - \frac{1}{4}z + \left(\frac{1}{8}\right)^2 = \frac{1}{8} + \left(\frac{1}{8}\right)^2$$

$$\left(z - \frac{1}{8}\right)^2 = \frac{1}{8} + \frac{1}{64}$$

$$= \frac{8+1}{64}$$

$$= \frac{9}{64}$$

$$\left(z - \frac{1}{8}\right)^2 = \left(\frac{3}{8}\right)^2$$ *(By Taking Square Root)*

$$\Rightarrow \quad z - \frac{1}{8} = \pm\frac{3}{8}$$

$$z = \frac{1}{8} \pm \frac{3}{8}$$

$$= \frac{1 \pm 3}{8}$$

$$z = \frac{1+3}{8} \quad or \quad z = \frac{1-3}{8}$$

$$z = \frac{4}{8} \quad or \quad z = -\frac{2}{8}$$

$$z = \frac{1}{2} \quad or \quad z = -\frac{1}{4}$$

So, S.S. is $\left\{\frac{1}{2}, -\frac{1}{4}\right\}$

vi. $m^2 - 6m = 15$

Sol: Given equation is:

$$m^2 - 6m = 15$$

Adding $(3)^2$ on both sides

$$m^2 - 6m + (3)^2 = 15 + (3)^2$$

$$(m-3)^2 = 15 + 9$$

$$(m-3)^2 = 24$$

$$(m-3)^2 = (24)^2$$

(By Taking Square Root)

$$m-3 = \pm\sqrt{24}$$

$$m = 3\pm\sqrt{24}$$

$$m = 3+\sqrt{24} \quad or \quad m = 3-\sqrt{24}$$

$$m = 3+2\sqrt{6} \quad or \quad m = 3-2\sqrt{6}$$

So, S.S is $\{3\pm 2\sqrt{6}\}$

vii. $-2x^2 - 4x + 6 = 0$

Sol: Given equation is:

$$-2x^2-4x+6=0$$

Dividing both sides by -2

$$x^2+2x-3=0$$

$$x^2+2x=3$$

Adding $(1)^2$ on both sides

$$x^2+2x+(1)^2 = 3+(1)^2$$

$$(x+1)^2 = 3+1$$

$$= 4$$

$(x+1)^2=(2)^2$ *(By Taking Square Root)*

$$\Rightarrow x+1 = \pm 2$$

$$x=-1\pm 2$$

$$x = -1+2 \quad or \quad x = -1-2$$

$$x = 1 \quad or \quad x = -3$$

So, S.S is $\{1,-3\}$

viii. $z^2+\frac{7}{8}z+\frac{3}{32}=0$

Sol: Given equation is:

$$z^2+\frac{7}{8}z+\frac{3}{32} = 0$$

$$z^2+\frac{7}{8}z=-\frac{3}{32}$$

Adding $\left(\frac{7}{16}\right)^2$ on both sides

$$z^2+\frac{7}{8}z+\left(\frac{7}{16}\right)^2 = -\frac{3}{32}+\left(\frac{7}{16}\right)^2$$

$$\left(z+\frac{7}{16}\right)^2 = -\frac{3}{32}+\frac{49}{256}$$

$$\left(z+\frac{7}{16}\right)^2 = \frac{-24+49}{256}$$

$$\left(z+\frac{7}{16}\right)^2 = \frac{25}{256}$$

$$\left(z+\frac{7}{16}\right)^2 = \left(\frac{5}{16}\right)^2$$

(By Taking Square Root)

$$\Rightarrow z+\frac{7}{16} = \frac{\pm 5}{16}$$

$$z = -\frac{7}{16}\pm\frac{5}{16}$$

$$= \frac{-7\pm 5}{16}$$

$$\Rightarrow z = \frac{-7+5}{16} \quad or \quad z = \frac{-7-5}{16}$$

$$z = -\frac{2}{16} \quad or \quad z = -\frac{12}{16}$$

$$z = -\frac{1}{8} \quad or \quad z = -\frac{3}{4}$$

So, S.S is $\left\{-\frac{1}{8}, -\frac{3}{4}\right\}$

ix. $-3s^2 - s + 1 = 0$

Sol: Given equation is:

$$-3s^2-s+1=0$$

$$-3s^2-s=-1$$

Dividing both sides by -3

$$s^2+\frac{1}{3}s=\frac{1}{3}$$

Adding $\left(\frac{1}{6}\right)^2$ on both sides

$$s+\frac{1}{3}s+\left(\frac{1}{6}\right)^2 = \frac{1}{3}+\left(\frac{1}{6}\right)^2$$

$$\left(s+\frac{1}{6}\right)^2 = \frac{1}{3}+\frac{1}{36}$$

$$\left(s+\frac{1}{6}\right)^2 = \frac{12+1}{36}$$

$$\left(s+\frac{1}{6}\right)^2 = \frac{13}{36}$$

$$\left(s+\frac{1}{6}\right)^2 = \left(\frac{\sqrt{13}}{6}\right)^2$$

(By Taking Square Root)

$$\Rightarrow \quad s+\frac{1}{6} = \pm\frac{\sqrt{13}}{6}$$

$$s = -\frac{1}{6}\pm\frac{\sqrt{13}}{6}$$

$$s = \frac{-1\pm\sqrt{13}}{6}$$

$$\Rightarrow \quad s = \frac{-1+\sqrt{13}}{6}, \quad s = \frac{-1-\sqrt{13}}{6}$$

So S.S is $\left\{\frac{-1+\sqrt{13}}{6}, \frac{-1-\sqrt{13}}{6}\right\}$

x. $px^2+qx+r=0, \quad p\neq 0$

Sol: Given equation is:

$$px^2+qx+r=0$$

$$px^2+qx=-r$$

Dividing both sides by p

$$x^2+\frac{q}{p}x=-\frac{r}{p}$$

Adding $\left(\frac{q}{2p}\right)^2$ on both sides

$$x^2+\frac{q}{p}+\left(\frac{q}{2p}\right)^2 = -\frac{r}{p}+\left(\frac{q}{2p}\right)^2$$

$$\left(x+\frac{q}{p}\right)^2 = -\frac{r}{p}+\frac{q^2}{4p^2}$$

$$\left(x+\frac{q}{2p}\right)^2 = \frac{-4pr+q^2}{4p^2}$$

$$\left(x+\frac{q}{2p}\right)^2 = \left(\frac{\sqrt{q^2-4pr}}{2p}\right)^2$$

$$\Rightarrow \quad x+\frac{q}{2p} = \frac{\pm\sqrt{q^2-4pr}}{2p}$$

$$x = \frac{-q\pm\sqrt{q^2-4pr}}{2p}$$

$$x = -\frac{q}{2p}\pm\frac{\sqrt{q^2-4pr}}{2p}$$

So, S.S is $\left\{\frac{-q\pm\sqrt{q^2-4pr}}{2p}\right\}$

Exercise 1.12

Q.1 Find the solution set of standard equation $ax^2+bx+c=0$ for the following values.

i. $a=1, b=-3, \ c=-5$

Sol: Given

$a=1$

$b=-3$

$c=-5$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-3)\pm\sqrt{(-3)^2-4(1)(-5)}}{2(1)}$$

$$=\frac{3\pm\sqrt{9+20}}{2}$$

$$=\frac{3+\sqrt{29}}{2}$$

So, S.S. is $\left\{\frac{3\pm\sqrt{29}}{2}\right\}$

ii. a = 2, b = – 9, c = 9

Sol: Given

$a = 2$

$b = -9$

$c = 9$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-(-9)\pm\sqrt{(-9)^2-4(2)(9)}}{2(2)}$$

$$=\frac{9\pm\sqrt{81-72}}{4}$$

$$=\frac{9\pm\sqrt{9}}{4}$$

$$=\frac{9\pm3}{4}$$

$x = \frac{9+3}{4}$ *or* $x = \frac{9-3}{4}$

$x = \frac{12}{4}$ *or* $x = \frac{6}{4}$

$= 3$ *or* $x = \frac{3}{2}$

So, S.S. is $=\left\{3, \frac{3}{2}\right\}$

iii. a = 5, b = 8, c = 3

Sol: Given

$a = 5$

$b = 8$

$c = 3$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-8\pm\sqrt{8^2-4(5)(3)}}{2(5)}$$

$$=\frac{-8\pm\sqrt{64-60}}{10}$$

$$=\frac{-8\pm\sqrt{4}}{10}$$

$$=\frac{-8\pm2}{10}$$

$x = \frac{-8+2}{10}$ *or* $x = \frac{-8-2}{10}$

$x = \frac{-6}{10}$ *or* $x = \frac{-10}{10}$

$x = -\frac{3}{5}$ *or* $x = -1$

So, S.S is $\left\{-\frac{3}{5}, -1\right\}$

iv. a = 1, b = – 5, c = 6

Sol: Given

$a = 1$

$b = -5$

$c = 6$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-(-5)\pm\sqrt{(-5)^2-4(1)(6)}}{2(1)}$$

$$x=\frac{-(-5)\pm\sqrt{(-5)^2-4(1)(6)}}{2(1)}$$

$$=\frac{5\pm\sqrt{25-24}}{2}$$

$$=\frac{5\pm\sqrt{1}}{2}$$

$$=\frac{5\pm1}{2}$$

$x = \frac{5+1}{2}$ *or* $x = \frac{5+1}{2}$

$x = \frac{6}{2}$ *or* $x = \frac{4}{2}$

$x = 3$ *or* $x = 2$

So, S.S is {3, 2}

Q.2 Find the solution set of following equations by quadratic formula.

i. $x^2 - 6x - 7 = 0$

Sol: Given equation is:

$x^2 - 6x - 7 = 0$

Here

$a = 1$

$b = -6$

$c = -7$

Put values in

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-7)}}{2(1)}$$

$$= \frac{6 \pm \sqrt{36 + 28}}{2}$$

$$= \frac{6 \pm \sqrt{64}}{2}$$

$$= \frac{6 \pm 8}{2}$$

$x = \frac{6+8}{2}$ or $x = \frac{6-8}{2}$

$x = \frac{14}{2}$ or $x = \frac{-2}{2}$

$x = 7$ or $x = -1$

So, S.S is $\{-1, 7\}$

ii. **$3x^2 - 5x - 6 = 0$**

Sol: Given equation is:

$3x^2 - 5x - 6 = 0$

Here

$a = 3$

$b = -5$

$c = -6$

Put values in

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(-6)}}{2(3)}$$

$$= \frac{5 \pm \sqrt{25 + 72}}{6}$$

$$x = \frac{5 \pm \sqrt{97}}{6}$$

So, S.S is $\left\{\frac{-5 \pm \sqrt{97}}{6}\right\}$

iii. **$12x^2 + 5x - 12 = 0$**

Sol: Given equation is:

$12x^2 + 5x - 12 = 0$

Here

$a = 12$

$b = 5$

$c = -12$

Put values in

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-5 \pm \sqrt{(5)^2 - 4(12)(-12)}}{2(12)}$$

$$= \frac{-5 \pm \sqrt{25 + 576}}{24}$$

$$x = \frac{-5 \pm \sqrt{601}}{24}$$

So, S.S. is $\left\{\frac{-5 \pm \sqrt{601}}{24}\right\}$

iv. $6x^2 - 7 = 11x$

Sol: Given equation is:

$6x^2 - 7 = 11x$

$6x^2 - 11x - 7 = 0$

Here

$a = 6$

b = −11

c = − 7

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-11)\pm\sqrt{(-11)^2-4(6)(-7)}}{2(6)}$$

$$=\frac{11\pm\sqrt{121+168}}{12}$$

$$=\frac{11\pm\sqrt{289}}{12}$$

$$=\frac{11\pm17}{12}$$

$x=\frac{11+17}{12}$ *or* $x=\frac{11-17}{12}$

$x=\frac{28}{12}$ *or* $x=\frac{-6}{12}$

$x=\frac{7}{3}$ *or* $x=-\frac{1}{2}$

So, S.S. is $\left\{\frac{-1}{2},\ \frac{7}{3}\right\}$

v. $-8x = 3 + 5x^2$

Sol: Given equation is:

$$-8x=3+5x^2$$

or $5x^2+8x+3=0$

Here

a = 5

b = 8

c = 3

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-8\pm\sqrt{(8)^2-4(5)(3)}}{2(5)}$$

$$=\frac{-8\pm\sqrt{64-60}}{10}$$

$$=\frac{-8\pm\sqrt{4}}{10}$$

$$=\frac{-8\pm2}{10}$$

$x=\frac{-8+2}{10}$ *or* $x=\frac{-8-2}{10}$

$x=\frac{-6}{8}$ *or* $x=\frac{-10}{10}$

$x=-\frac{3}{5}$ *or* $x=-1$

So, S.S is $\left\{-1,-\frac{3}{5}\right\}$

vi. $1 - 18x + 45x^2 = 0$

Sol: Given equation is:

$$45x^2-18x+1=0$$

Here

a = 45

b = -18

c = 1

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{(-18)\pm\sqrt{(-18)^2-4(45)(1)}}{2(45)}$$

$$=\frac{18\pm\sqrt{324-180}}{90}$$

$$=\frac{18\pm\sqrt{144}}{90}$$

$$=\frac{18\pm12}{90}$$

$x=\frac{18+12}{90}$ *or* $x=\frac{18-12}{90}$

$x=\frac{30}{90}$ or $x=\frac{6}{90}$

$x=\frac{1}{3}$ or $x=\frac{1}{15}$

So, S.S is $\left\{\frac{1}{3},\frac{1}{15}\right\}$

vii. $\mathbf{15x^2-13x+2=0}$

Sol: Given equation is:

$$15x^2-13x+2=0$$

Here

$a=15$

$b=-13$

$c=2$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-13)\pm\sqrt{(-13)^2-4(15)(2)}}{2(15)}$$

$$=\frac{13\pm\sqrt{169-120}}{30}$$

$$=\frac{13\pm\sqrt{49}}{30}$$

$$=\frac{13\pm7}{30}$$

$\Rightarrow x=\frac{13+7}{30}$ or $x=\frac{13-7}{30}$

$x=\frac{20}{30}$ or $x=\frac{6}{30}$

$x=\frac{2}{3}$ or $x=\frac{1}{5}$

So, S.S is $\left\{\frac{1}{5},\frac{2}{3}\right\}$

viii. $1+\frac{1}{2}x-3x^2=0$

Sol: Given equation is:

$$1+\frac{1}{2}x-3x^2=0$$

Multiplying both sides by 2

$$2+x-6x^2=0$$

$$6x^2-x-2=0$$

Here

$a=6$

$b=-1$

$c=-2$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-1)\pm\sqrt{(-1)^2-4(6)(-2)}}{2(6)}$$

$$=\frac{1\pm\sqrt{1+48}}{12}$$

$$=\frac{1\pm\sqrt{49}}{12}$$

$$=\frac{1\pm7}{12}$$

$x=\frac{1+7}{12}$ or $x=\frac{1-7}{12}$

$x=\frac{8}{12}$ or $x=\frac{-6}{12}$

$x=\frac{2}{3}$ or $x=\frac{-1}{2}$

So, S.S. is $\left\{\frac{2}{3},\frac{-1}{2}\right\}$

ix. $3sx^2+2tx+3=0$

Sol: Given equation is:

$$3sx^2+2tx+3=0$$

Here

$a=3s$

$b=2t$

$c=3$

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-2t\pm\sqrt{(2t)^2-4(3s)(3)}}{2(3s)}$$

$$=\frac{-2t\pm\sqrt{4t^2-36s}}{6s}$$

$$=\frac{-2t\pm\sqrt{4(t^2-9s)}}{6s}=\frac{-2t\pm2\sqrt{(t^2-9s)}}{6s}$$

$$=\frac{2\left(-t\pm\sqrt{t^2-9s}\right)}{6s}$$

$$=\frac{-t\pm\sqrt{t^2-9s}}{3s}$$

So, S.S is $\left\{\frac{-t\pm\sqrt{t^2-9s}}{3s}\right\}$

x. $lx^2-mx-n=0$

Sol: Given equation is:

$$lx^2-mx-n=0$$

Here

a = l

b = –m

c = – n

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-m)\pm\sqrt{(-m)^2-4l(-n)}}{2l}$$

$$x=\frac{m\pm\sqrt{m^2+4ln}}{2l}$$

So, S.S is $\left\{\frac{m\pm\sqrt{m^2+4ln}}{2l}\right\}$

xi. 6(x + 4) = x(x – 4)

Sol: Given equation is:

$$6(x+4)=x^2-4x$$

or $\quad x^2-4x=6(x+4)$

$$x^2-4x=6x+24$$

$$x^2-4x-6x-24=0$$

$$x^2-10x-24=0$$

Here

a = 1

b = –10

c = – 24

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-10)\pm\sqrt{(-10)^2-4(1)(-24)}}{2(1)}$$

$$=\frac{10\pm\sqrt{100+96}}{2}$$

$$=\frac{10\pm\sqrt{196}}{2}$$

$$=\frac{10\pm14}{2}$$

$x=\frac{10+14}{2}$ or $x=\frac{10-14}{2}$

$x=\frac{24}{2}$ or $x=\frac{-4}{2}$

$x=12$ or $x=-2$

$x=12$ or $x=-2$

So, S.S is {12, -2}

xii. 5(4 – 2x) = 7x(x – 2)

Sol: Given equation is:

$$5(4-2x)=7x(x-2)$$

$$20-10x=7x^2-14x$$

$$7x^2-14x=20-10x$$

$$7x^2-14x+10x-20=0$$

$$7x^2-4x-20=0$$

Here

a = 7

b = –4
c = – 20
Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-4)\pm\sqrt{(-4)^2-4(7)(-20)}}{2(7)}$$

$$=\frac{4\pm\sqrt{16+560}}{14}$$

$$=\frac{4\pm\sqrt{576}}{14}$$

$$=\frac{4\pm 24}{14}$$

$$x=\frac{4+24}{14}\quad,\quad x=\frac{4-24}{14}$$

$$x=\frac{28}{14}\quad,\quad x=\frac{-20}{14}$$

$$x=2\quad,\quad x=\frac{-10}{7}$$

So, S.S is $\left\{\frac{-10}{7},\ 2\right\}$

Q.3 Find the solution set of following equations.

i. $x^2+\frac{1}{2}x-\frac{3}{2}=0$

Sol: Given equation is:

$$x^2+\frac{1}{2}x-\frac{3}{2}=0$$

$$2x^2+x-3=0$$
$$2x^2+3x-2x-3=0$$
$$x(2x+3)-1(2x+3)=0$$
$$(2x+3)(x-1)=0$$

$\Rightarrow\quad 2x+3=0 \quad or \quad x-1=0$

$\Rightarrow\quad x=-\frac{3}{2}\ or \quad x=1$

So, S.S is $\left\{-\frac{3}{2},\ 1\right\}$

ii. $x^2-\frac{19}{2}x+22=0$

Sol: Given equation is:

$$x^2-\frac{19}{2}x+22=0$$

$$2x^2-19x+44=0$$
$$2x^2-8x-11x+44=0$$
$$2x(x-4)-11(x-4)=0$$
$$(x-4)(2x-11)=0$$

$\Rightarrow\quad x-4=0 \quad or \quad 2x-11=0$

$x=4 \quad or \quad x=\frac{11}{2}$

So, S.S is $\left\{\frac{11}{2},\ 4\right\}$

iii. $5x^2+5x-4=0$

Sol: Given equation is:

$$5x^2+5x-4=0$$

Here
a = 5
b = 5
c = -4

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-5\pm\sqrt{(5)^2-4(5)(-4)}}{2(5)}$$

$$=\frac{-5\pm\sqrt{25+80}}{10}$$

$$=\frac{-5\pm\sqrt{105}}{10}$$

So, S.S is $\left\{\frac{-5+\sqrt{105}}{10},\ \frac{-5-\sqrt{105}}{10}\right\}$

iv. $8x^2+26x+14=0$

Sol: Given equation is:

$$8x^2+26x+14=0$$

Here

a = 8

b = 26

c = 14

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-26\pm\sqrt{(26)^2-4(8)(14)}}{2(8)}$$

$$=\frac{-26\pm\sqrt{676-448}}{16}$$

$$=\frac{-26\pm\sqrt{288}}{16}$$

$$=\frac{-26\pm2\sqrt{57}}{30}$$

$$=\frac{2\left(-13\pm\sqrt{57}\right)}{16}$$

$$=\frac{-13\pm\sqrt{57}}{8}$$

So, S.S. is $\left\{\frac{-13+\sqrt{57}}{8}\quad,\quad\frac{-13-\sqrt{57}}{8}\right\}$

v. $4x^2-2x-64=0$

Sol: Given equation is:

$$4x^2-2x-64=0$$

$$2x^2-x-32=0$$

Here

a = 2

b = -1

c = -32

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-1)\pm\sqrt{(-1)^2-4(2)(-32)}}{2(2)}$$

$$=\frac{1\pm\sqrt{1+256}}{4}$$

$$=\frac{1\pm\sqrt{257}}{4}$$

S.S $=\frac{1\pm\sqrt{1\pm257}}{4}$

So, S.S is $\left\{\frac{1\pm\sqrt{257}}{4}\right\}$

vi. $x^2-x-9=0$

Sol: Given equation is:

$$x^2-x-9=0$$

Here

a = 1

b = –1

c = –9

Put values in

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-(-1)\pm\sqrt{(-1)^2-4(1)(-9)}}{2(1)}$$

$$=\frac{1\pm\sqrt{1+36}}{2}$$

$$=\frac{1\pm\sqrt{37}}{2}$$

So, S.S is $\left\{\frac{1\pm\sqrt{37}}{2}\right\}$

vii. $x^2-\frac{31}{10}x+\frac{3}{2}=0$

Sol: Given equation is:

$$x^2 - \frac{31}{10}x + \frac{3}{2} = 0$$

Multiplying both sides by 10

$$10x^2 - 31x + 15 = 0$$

Here

a = 10

b = –31

c = 15

Put values in

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-31) \pm \sqrt{(-31)^2 - 4(10)(15)}}{2(10)}$$

$$= \frac{31 \pm \sqrt{961 - 600}}{20}$$

$$= \frac{31 \pm \sqrt{361}}{20}$$

$$= \frac{31 \pm 19}{20}$$

$$x = \frac{31+19}{20} \quad or \quad x = \frac{31-19}{20}$$

$$x = \frac{50}{20} \quad or \quad x = \frac{12}{20}$$

$$x = \frac{5}{2} \quad or \quad x = \frac{3}{5}$$

So, S.S is $\left\{\frac{5}{2}, \frac{3}{5}\right\}$

viii. $28y^2 + 15y + 8 = 0$

Sol: Given equation is:

$$28y^2 + 15y + 8 = 0$$

Here

a = 28

b = 15

c = 8

Put values in

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-(15) \pm \sqrt{(15)^2 - 4(8)(8)}}{2(8)}$$

$$y = \frac{-15 \pm \sqrt{225 - 256}}{16}$$

$$y = \frac{-15 \pm \sqrt{-31}}{16}$$

So, S.S is $\left\{\frac{-15 \pm \sqrt{-31}}{16}\right\}$

EXAMPLES

Example 1:

Solve $\frac{x}{2} - 6 = 4$

Solution:

$$\frac{x}{2} - 6 = 4$$

or $\frac{x}{2} - 6 + 6 = 4 + 6$ (adding 6 on both sides)

or $\frac{x}{2} = 10$

or $\frac{x}{2} - 6 \times 2 = 10 \times 2$ (multiplication both the side by 2)

or $x = 20$

$\therefore$ Solution set = {20}

Example 2:

Solve $\frac{x+1}{2} - \frac{x+1}{3} = 2\left(1 + \frac{x+3}{4}\right)$

Solution:

$$\frac{x+1}{2} - \frac{x+1}{3} = 2\left(1 + \frac{x+3}{4}\right)$$

or $\frac{3x+3-2x-2}{6} = 2\left(\frac{4-x-3}{4}\right)$

or $\frac{x+1}{6} = 2\left(\frac{1-x}{4}\right)$

or $\frac{x+1}{6} = \frac{1-x}{2}$

or $6 \times \frac{x+1}{6} = 6 \times \frac{1-x}{2}$

(multiplying both the sides by 6)

or $x + 1 = 3(1 - x)$

or $x + 1 = 3 - 3x$

or $4x = 2$

or $x = \frac{2}{4} = \frac{1}{2}$

Example 3:

Solve the following equations by substitution method

$2x + y = 1$ (i)

$3x - y = 4$ (ii)

Solution:

From equation (i), we have

$y = 1 - 2x$ (iii)

Substituting the value of y in equation (ii), we get

$3x - (1 - 2x) = 4$

or $3x - 1 + 2 = 4$

or $5x - 1 = 4$

or $5x = 5$

or $\frac{5x}{5} = \frac{5}{5}$

or $x = 1$

Substituting the value of x in equation (iii), we get

$y = 1 - 2x$

$= 1 - 2(1)$

$= 1 - 2 = -1$

$\therefore$ Solution $= \{(x, y)\} = \{(1, -1)\}$

Example 4:

Solve the following equations by comparison method.

$x - y = -2$ (i)

$x + y = -1$ (ii)

Solution:

From equation (i), we have

$x = -2 + y$ (iii)

From equation (ii), we have

$x = 1 - y$ (iv)

Comparing equation (iii) and (iv), we get

$-2 + y = 1 - y$

or $y + y = 1 + 2$

or $2y = 3$

or $y = \frac{3}{2}$

Substituting the value of y in equation (iv), we get

$$x = 1 - \frac{3}{2} = \frac{2-3}{2}$$

$$= \frac{-1}{2}$$

$\therefore$ solution set $= \{(x, y)\} = \left\{\left(\frac{-1}{2}; \frac{3}{2}\right)\right\}$

Example 5:

Solve the following equations by equating the co-efficient.

$3x + 2y = 1$ (i)
$2x - y = 2$ (ii)

Solution:

multiplying equation (i) by 2 and equation (ii) by 3, we get

$6x + 4y = 2$ (iii)
$6x - 3y = 6$ (iv)

Substituting equation (iv) from equation (iii), we get

$$\begin{array}{r} x + 4y = 2 \\ 6x - 3y = 6 \\ - \quad + \quad - \\ \hline 7y = -4 \end{array}$$

Putting this value of y in equation (ii), we get

$$2x-\left(\frac{-4}{7}\right)=2$$

or $2x=\frac{14-4}{7}=2$ *or* $2x=\frac{10}{7}$

or $2x+\frac{4}{7}=2$ *or* $2x=2-\frac{4}{7}$

or $x = \frac{5}{7}$

$\therefore$ solution set $\left\{\left(\frac{5}{7},\frac{-4}{7}\right)\right\}$

Example 6:

The sum and difference of two numbers is 28 and 12 respectively.

Find the number

Solution:

Suppose that the

First number $= x$

Second number $= 28 - x$

Their difference $= (28 - x) - x$
$= 28 - x - x$
$= 28 - 2x$

According to given condition

$28 - 2x = 12$
or $-2x = 12 - 28$
or $-2x = -16$ (dividing by -2)
or $x = 8$

So, the first number $= x = 8$

And the second number $= 28 - x$
$= 28 - 8$
$= 20$

$\therefore$ 8 and 20 are the required numbers.

Example 7:

Length and width of a rectangle are $\frac{x+1}{2}cm$ and $\frac{x+1}{4}cm$ respectively. If perimeter of the rectangle is 33 cm, find the length and width of the rectangle.

Solution:

Length of the rectangle $= \frac{x+1}{2}cm$

Width of the rectangle $= \frac{x+1}{4}cm$

Perimeter of the rectangle $= 33cm$

$\therefore\ 2\left(\frac{x+1}{2}\right)+2\left(\frac{x+1}{4}\right) = 33$

or $x+1+\frac{x+1}{2} = 33$

or $\frac{2x+2+x+1}{2} = 33$

or $\frac{3x+3}{2} = 33$

or $3x + 3 = 66$
or $3(x + 1) = 66$
or $x + 1 = 22$
or $x = 21$

$\therefore$ required length $= \frac{x+1}{2}$ and

required width $= \frac{x+1}{4}$

$= \frac{21+1}{2}$ $\quad$ $= \frac{21+1}{4}$

$= \frac{22}{2}$ $\quad$ $= \frac{22}{4}$

Example 8:

A number consists of two digits. The digits at ten's place 2-times of the digits at unit's place. The digits in the number are interchanged to form a new number. The sum of the new and the original numbers is 99. Find the number.

Solution:

Let the digits at unit's place be x and the digits at the ten's place by y.

$\therefore$ The number = x + 10y

On interchanging the digits we get the new number as

New number = y + 10x

According to the first condition, we have

$y = 2x \quad \text{(i)}$

According to the second condition, we have

$(x + 10y) + (y + 10x) = 99$

or $\quad 11x + 11y = 99$

or $\quad x + y = 9 \quad \text{(ii)}$

Solving equations (i) and (ii) simultaneously, we get

$x = 3$

and $\quad y = 2x$

$= 2(3)$

$= 6$

$\therefore$ required number is 63

Example 9:

The difference between the numerator and the denominator of a fraction is 6. If 2 are added to the numerator and denominator, the new fraction becomes $\frac{3}{2}$.

Find the fraction.

Solution:

Let x be the numerator and y be denominator.

$\therefore$ Fraction $= \frac{x}{y}$.

According to the first condition we have

$x - y = 6 \quad \text{(i)}$

According to the first condition, we have

$\frac{x+2}{y+2} = \frac{3}{2}$

or $\quad 2(x + 2) = 3(y + 2)$

or $\quad 2x + 4 = 3x + 6$

or $\quad 2x - 4y = 2$

Solving equations (i) and (ii) simultaneously, we get

$$\begin{array}{r} 2x - 2y = 12 \\ 2x - 3y = 2 \\ - \quad + \quad\quad - \\ \hline y = 10 \end{array}$$

Now putting the value of y in equation (i), we get

$x - 10 = 6$

or $\quad x = 16$

$\therefore$ required fraction $= = \frac{x}{y} = \frac{16}{10}$

Example 10:

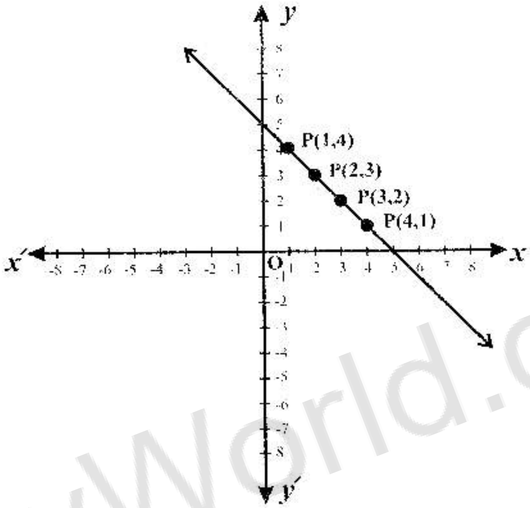
Plot the graph of $\{(x, y) \mid x, y \in R \wedge x + y = 5\}$

Solution:

$\{(x, y) \mid x, y \in R \wedge x + y = 5\}$

The following ordered pairs satisfy the equation $x + y = 5$:

x	1	2	3	4
y	4	3	2	1
(x, y)	(1, 4)	(2, 3)	(3, 2)	(4, 1)



Locating these points in the Cartesian plane and by joining them through straight line. We get the graph of the equation $x + y = 5$ as a straight line.

Example 11:

Plot the graph of: $2x + 5y = -3$ $x \in R$

Solution: $2x + 5y = -2$

or $5y = -3 - 2x$

or $y = \dfrac{-3-2x}{5}$

For $x = 1$, $y = \dfrac{-3-2(1)}{5} = \dfrac{-5}{5} = -1$

For $x = -4$,

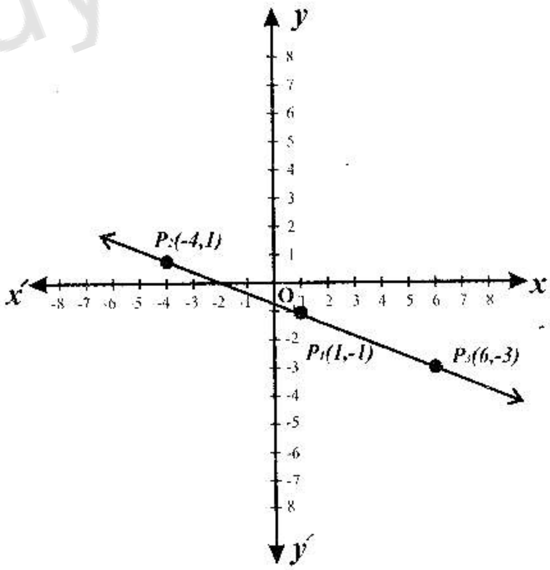
$$y = \frac{-3-2(-4)}{5} = \frac{-3+8}{5} = \frac{5}{5} = 1$$

For $x=6$, $y = \dfrac{-3-2(6)}{5} = \dfrac{-3-12}{5} = \dfrac{-15}{5} = -3$ For $x = 11$

$$y = \frac{-3-2(11)}{5} = \frac{-3-22}{5} = \frac{-25}{5} = -5$$

Table for equation $2x + 5y = -3$

X	1	-4	6	11
Y	-1	1	-3	-5
(x, y)	(1, -1)	(-4, 1)	(6, -3)	(11, -5)



Location these points in the Cartesian place and joining them through a straight line, we get the graph of the equation $2x + 5y = -3$

Example 12:

Plot the graph of $2x - y = 4$

Solution:

$2x - y = 4$

$y = 2x - 4$

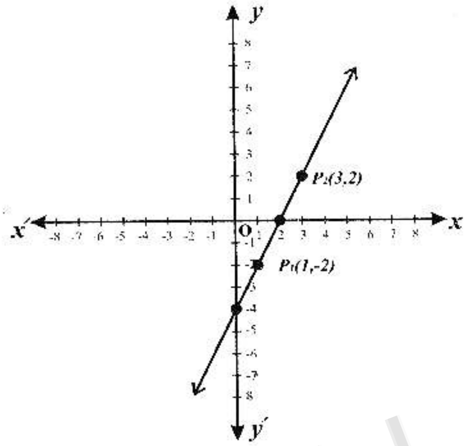
For $x = 1$, $y = 2(1) - 4 = 2 - 4 = -2$

For $x = 3$, $y = 2(3) - 4 = 6 - 4 = 2$

Table for equation $2x + 5y = -3$

X	1	3
Y	-2	2
(x, y)	(1, -2)	(3, 2)

Location these point in the Cartesian plane and by joining them we get the graph of the equation $2x - y = 4$ as a straight line.



Example 13:

Solve the following equations graphically.

$$x + y = 1$$
$$3x + 2y = 0$$

Solution:

$x + y = 1$; $3x + 2y = 0$

or $y = 1 - x$ (i) ; or $2y = -3x$

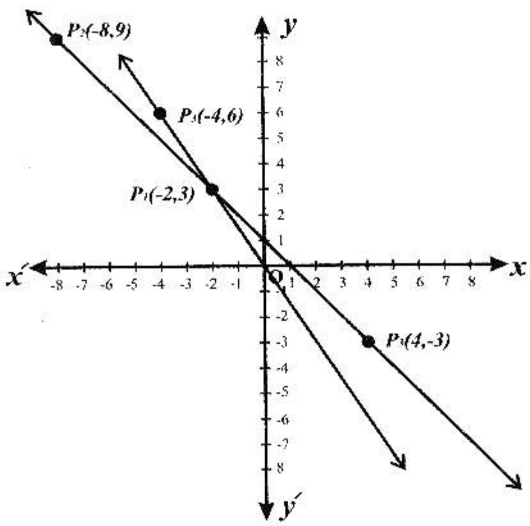
; or $y = \frac{-3}{2}x$

Table for $x + y = 1$

x	10	-8	4
y	-9	9	-3
(x, y)	(10,-9)	(-8, 9)	(4, -3)

Table for $3x + 2y = 0$

x	-2	8	-4
y	3	-12	6
(x, y)	(-2, 3)	(2, -3)	(-4, -6)



The graphs of both lines intersect at the point (-2,3). Therefore, there solutions set are {(-2, 3)}

Check:

$x + y = 1$; $3x + 2 = 0$

$2 + 3 = 1$; $3(-2) + 2(3) = 0$

$1 = 1$; $-6 + 6 = 0$

; $0 = 0$

Example 14:

Find the solution set of following equations graphically.

$2x - 2y = 1$ (i)

$x - y = 6$ (ii)

Solution:

From (i), we have ; From (ii) de have

$$y = \frac{2x-1}{2} \quad ; \quad y = x - 6$$

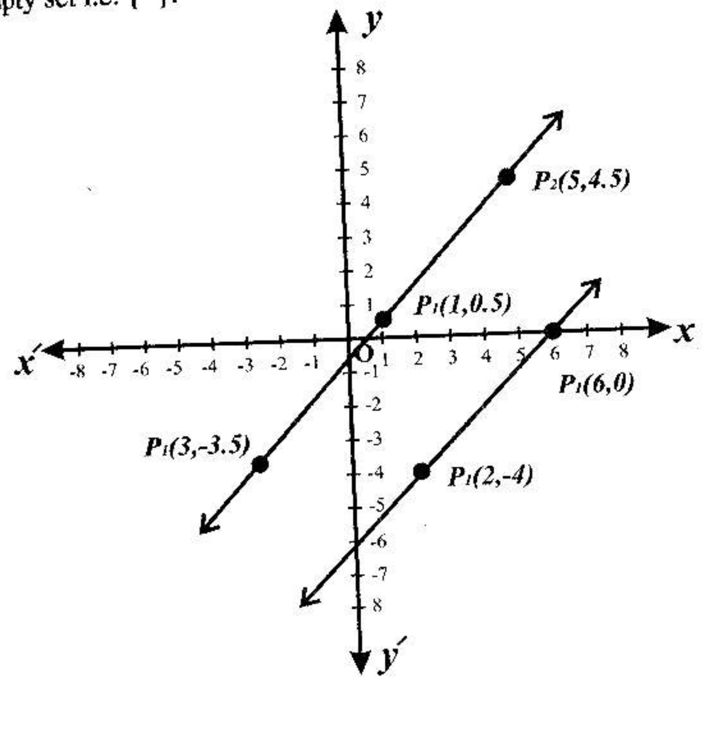
Table for equation 2x + 2y = - 1

x	1	5	-3
y	0.5	4.5	-3.5
(x, y)	(1, 0.5)	(5, 4.5)	(-3, -3.5)

Table for equation x - y = 6

x	2	10	6
y	-4	4	0
(x, y)	(-2, -4)	(10, 4)	(6, 0)

The graphs of both the equations consist of parallel lines. Therefore, the solution set of the equations is an empty set i.e. { }.



Example 15:

Solve $\sqrt{x}-8=2$

Solution:

$\sqrt{x}-8=2$

or $\sqrt{x}-8=2$

Squaring both the sides, we get equation, we get

or $(\sqrt{x})^2=(10)^2$ or

or $x = 100$ or

Thus, solution set = $\{100\}$

Check: Putting x = 100 in the given equation we get:

$\sqrt{100} - 8 = 2$

$10 - 8 = 2$

$2 = 2$

Example 16:

Find the solution of: $\sqrt{3y+3}=\sqrt{3y-5}$.

Solution:

$\sqrt{3y+3}=\sqrt{3y-5}$

Taking square of both the sides, we have

$(\sqrt{3y+3})^2=\left(\sqrt{3y-5}\right)^2$

or $y + 3 = 3y - 5$

or $3 + 5 = 3y - y$

or $8 = 2y$

or $2y = 8$

or $y = 4$

$\therefore$ solution set = $\{4\}$

Check: Putting y = 4 in the given equation, we have

$\sqrt{4+3}=\sqrt{3\times4-5}$

$\sqrt{7}=\sqrt{12-5}$

$\sqrt{7}=\sqrt{7}$

Example 17:

Solve $2\sqrt{3x+1}+4=3$

Solution:

$2\sqrt{3x+1}+4=3$

or $2\sqrt{3x+1}=3-4$

or $2\sqrt{3x+1}=-1$

Taking square of both the sides,

Check: Putting $x=\frac{1}{4}$ in the given equation, we have

$2\sqrt{3(-\frac{1}{4})+1}+4=3$

or $2\sqrt{\frac{1}{4}}+4=3$

We have

$4(3x + 1) = 1$ or $2\times\frac{1}{2}+4=3$

or $3x + 1 = \frac{1}{4}$ or $5 = 3$

or $x = \frac{-1}{4}$ or $5\neq 3$

$\therefore$ Solution set is { } or Φ.

Note:

The equation in which radical expression is equal a negative number, have no solutions in real numbers.

Example 18:

Find the solution set of $|2x| = 6$ when $x \in R$

Solution:

$|2x| = 6$

From the above definition, there are two situations.

$2x = 6$ (i)

$2x = -6$ (ii)

From equation (i), we have

$x = 3$

Note: For all $x, y \in R$

(i) $|xy| = |x|\,|y|$

(ii) $\left|\frac{x}{y}\right| = \frac{|x|}{|y|}$ *for* $y\neq 0$

From equation (ii) we have

$x = -3$

$\therefore$ solution set $\{3, -3\}$

Note: If $x \in N$, then the solution set of $|2x| = 6$ is $\{3\}$

Example 19:

Find the solution set of $\frac{|y-3|}{3} = \frac{|y+2|}{3}$ when $y \in R$

Solution:

$$\frac{|y-3|}{3} = \frac{|y+2|}{3}$$

or $$\left|\frac{y-3}{3}\right| = \frac{3}{2} \Rightarrow \left|\frac{y-3}{y+2}\right| = \frac{3}{2}$$

$$\frac{y-3}{y+2} = \pm\frac{3}{2}$$

$\frac{y-3}{y+2}=\frac{3}{2}$ or $\frac{y-3}{y+2}=\frac{-3}{2}$

$\Rightarrow$ 2y - 6 = 3y + 6 or 2(y - 3) = -3(y + 2)

$\Rightarrow$ 2y - 3y = 6 + 6 or 2y - 6 = - 3y - 6

$\Rightarrow$ $-y = 12$ or 2y + 3y = -6 + 6

$\Rightarrow$ $y = -12$ or 5y = 0

$\therefore$ solution set { 0. -12 } or y = 0

Example 20:

Find the solution set of $\left|\frac{y+2}{3}\right|-3=-5$

Solution:

$$\left|\frac{y+2}{3}\right|-3=-5$$

or $\left|\frac{y+2}{3}\right|=-5+3$

or $\left|\frac{y+2}{3}\right|=-2$ Since the absolute value of non-zero integer is always positive.

Therefore, the solution set of the given equation is { }.

Example 21:

Find the solution set of 6x - 8 < x + 7, where x ∈ R and represent the solution set on the number line.

Solution:

Given that

6x - 8 < x + 7 ------------------(i)

or 6x - 8 + 8 < x + 7 + 8 $(\because x < y \Rightarrow x + z < y + z)$

or 6x < x + 15

or 6x - x < x - x + 15

or 5x < 15

or $\frac{1}{5}\times 5x < 15\times\frac{1}{5}$

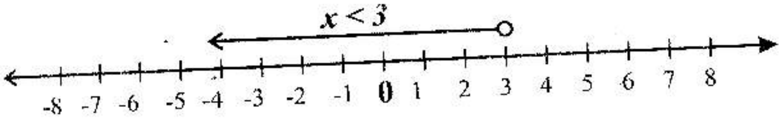
or $(\because x < y \Rightarrow zx < zy \text{ for } z > 0)$

or x < 3 ------------------ (ii)

$\therefore$ the solution set of the in-equations is x < 3

solution set = { x | x ∈ R ∧ x < 3}

Representation on real line:



Example 22:

Find the solution set of $7 - 4x < -5$, where $x \in R$, and represent it on number line.

Solution:

$7 - 4x < -5$

or $7 - 4x - 7 < -5 - 7$

or $-4x < -12$

or $(-1)(4x) > (-1)(-12)$ $\quad (\therefore x < y => xz > yz \text{ for } z < 0)$

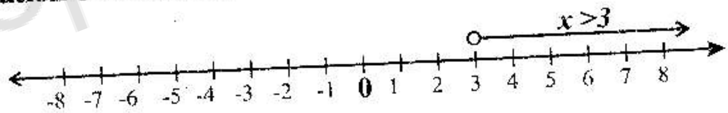
or $4x > 12$

or $x > 3$

Therefore, the solution set consists of the all real numbers which are greater than 3

$\therefore$ solution set $= \{x \mid x \in R \wedge x > 3\}$

Representation on real line:



Example 23:

Find the solution set of $2y + 5 > 4y - 3$, where $y \in R$, and represent it on number line.

Solution:

$2y + 5 > 4y - 3$

or $2y - 2y + 5 > 4y - 2y - 3$

or $5 > 2y - 3$

or $5 + 3 > 2y - 3 + 3$

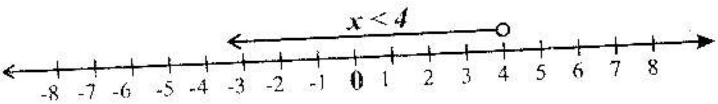
or $8 > 2y$

or $4 > y$

or $y > 4$

$\therefore$ Solution set $\{x \mid x \in R \wedge x < 4\}$

Representation on real line:



Example 24:

Find the solution set of $10 - 4x \geq x + 15$, where $x \in R$, and represent it on number line.

Solution:

$10 - 4x \geq x + 15$

or $10 - 4x - 10 \geq x + 15 - 10$

or $-4x \geq x + 5$

or $-4x - x \geq x + 5 - x$

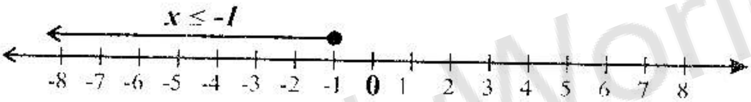
or $-5x \geq 5$

or $5x \leq -5$

or $x \leq -1$

$\therefore$ the solution set is = $\{ x \mid x \in R \wedge x \leq -1\}$

Representation on real line:



Example 25

Find the solution set of $-4 < x < 4$, where $x \in R$, and represent it on number line.

Solution:

$-4 < x < 4$

It can be written as

$-4 < x$ and $x < 4$

solutions et of $x < 4$ is $\{ x \mid x \in R \wedge x < 4\}$

solution set of $x < -4$ is $\{ x \mid x \in R \wedge x > -4\}$

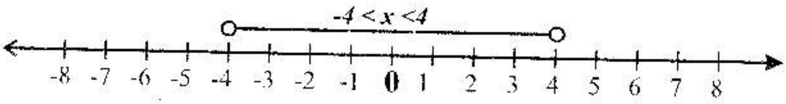
Since "and" condition exists in this compound sentence. Therefore, sentence is true for those values of x for which both $x < 4$ and $x > -4$ are satisfied simultaneously,

$\therefore$ solution set is the set of intersection of the two solutions i.e.

solution set = $\{ x \mid x \in R \wedge x < 4\} \cap \{ x \mid x \in R \wedge x > -4\}$

$= \{ x \mid x \in R \wedge -4 < x > 4\}$

Representation on real line:



Example 26:

Find the solution set of $|x + 2| < 4$,

where $x \in R$ and represent it on number line.

Solution:

Given that

$|x + 2| < 4$

$\Leftrightarrow -4 < x + 2 < 4$

Note: $|x| < a \Leftrightarrow -a < x < a$, where $a > 0$

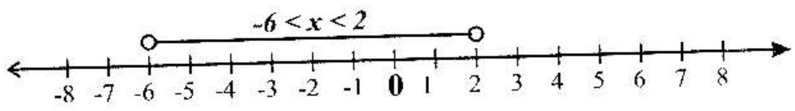
$\Leftrightarrow$ $x + 2 > -4$ or $x + 2 < 4$

$\Leftrightarrow$ $x + 2 - 2 > -4 - 2$ or $x + 2 - 2 < 4 - 2$

$\Leftrightarrow$ $x > -6$ or $x < 2$

$\therefore$ solution set $= \{ x \mid x \in R \wedge -6 < x < 2\}$

Representation on real line:



Example 27:

Find the solution set of $|x + 3| > 5$, where $x \in R$, and represent it on number line.

Solution:

$|x + 3| > 5$

$\Leftrightarrow$ $x + 3 > 5$ or $x + 3 < -5$

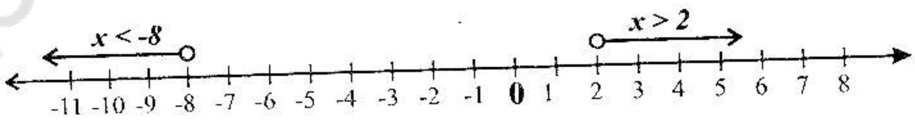
$\Leftrightarrow$ $x + 3 - 3 > 5 - 3$ or $x + 3 - 3 < -5 - 3$

$\Leftrightarrow$ $x > 2$ or $x < -8$

The solution set is the union of both the solutions.

Solution set $\{ x \mid x \in R \wedge x > 2 \vee x < -8 \}$

Representation on real line:



Example 28:

Find the solution set of $|x - 2| \le 4$, where $x \in R$, Also represent is on the number line.

Solution:

$|x - 2| \le 4$

Since $|x| \le a \Leftrightarrow -a \le x \le a$

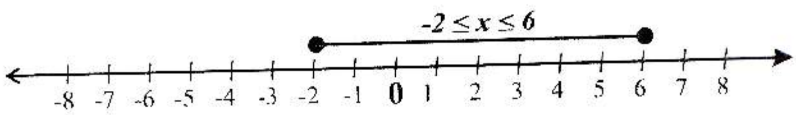
$\therefore$ $-4 \le x - 2 < 4$

$-4 + 2 \le x - 2 + 2 \le 4 + 2$

or $-2 \le x \le 6$

$\therefore$ solution set $= \{ x \mid x \in R \wedge -2 \le x \le 6 \}$

Representation on real line:



Example 29:

Find the solution set of $2x + 3 \leq 21$, where $x \in N$. Also represent it on the number line.

Solution:

$2x + 3 \leq 21$

or $2x + 3 - 3 \leq 21 - 3$

or $2x \leq 18$

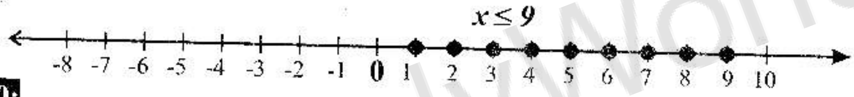
or $\dfrac{2x}{2} \leq \dfrac{18}{2}$

or $x \leq 9$

$\therefore$ solution set $= \{ x \mid x \in N \wedge x \leq 9 \}$

$= \{ 1, 2, 3, 4, 5, 6, 7, 8, 9 \}$

Representation on real line:



Example 30:

Find the solution set of $3x + 2 \leq 8$, where $x \in W$. Also represent it on the number line.

Solution:

$3x + 2 \leq 8$

or $2x + 2 - 2 \leq 8 - 2$

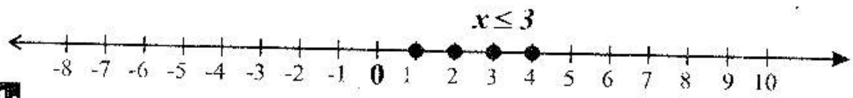
or $3x \leq 6$

or $\dfrac{3x}{3} \leq \dfrac{6}{3}$

or $x \leq 2$

$\therefore$ solution set $= \{ x \mid x \in W \wedge x \leq 2 \} = \{0, 1, 2\}$

Representation on real line:



Example 31:

$z(z - 1) = 0$ $\qquad\qquad$ $\forall\ a, b \in R,$

Solution:

$\Rightarrow\ z = 0$ or $z - 1 = 0$ $\qquad\qquad$ $ab = 0$

$\Rightarrow\ z = 0$ or $z = 1$ $\qquad\qquad$ $\Rightarrow\ a = 0$ or $b = 0$ or $a = b = 0$

Example 32:

$(y - 2)(y + 3) = 0$

Solution:

$\Rightarrow\ y - 2 = 0$ or $y + 3 = 0$

$\Rightarrow y = 2 \quad$ or $\quad y = 3$

Example 33:

Solve the following equation by factorization

$$x^2 + 7x + 12 = 0$$

Solution:

$x^2 + 7x + 12 = 0$

or $x^2 + 4x + 3x + 12 = 0$

or $x(x + 4) + 3(x + 4) = 0$

or $(x + 4)(x + 3) = 0$

$\Rightarrow x + 4 = 0 \quad$ or $\quad x + 3 = 0$

$\Rightarrow x = -4 \quad$ or $\quad x = -3$

$\therefore$ solution set $\{-4, -3\}$

Example 34:

Solve

(i). $x^2 - x - 42 = 0 \qquad$ (ii). $\frac{3}{7}x^2 - \frac{5}{14}x - \frac{2}{7} = 0$

by factorization.

Solution:

(i). $x^2 - x - 42 = 0$

or $x^2 - 7x + 6x - 42 = 0$

or $x(x - 7) + 6(x - 7) = 0$

or $(x - 7)(x + 6) = 0$

$\Rightarrow x - 7 = 0 \quad$ or $\quad x + 6 = 0$

$\Rightarrow x = 7 \quad$ or $\quad x = -6$

$\therefore$ solution set $\{7, -6\}$

(ii). $\frac{3}{7}x^2 - \frac{5}{14}x - \frac{2}{7} = 0$

or $6x^2 - 5x - 4 = 0 \qquad$ (multiplying both the sides by 14)

or $6x^2 - 8x + 3x - 4 = 0$

or $2x(3x - 4) + 1(3x - 4) = 0$

or $(3x - 4 = 0 \quad$ or $\quad 2x + 1 = 0$

$\Rightarrow 3x - 4 = 0 \quad$ or $\quad 2x + 1 = 0$

$\Rightarrow x = \frac{4}{3} \quad or \quad x = -\frac{1}{2}$

$\therefore$ solution set $= \left\{\frac{4}{3}, -\frac{1}{2}\right\}$

Note:

If the co-efficients of an equation are fractions, then we convert it in the standard from by multiplying the equation by their least common multiple (L.C.M) of the denominators of the fractions.

Example 35:

Solve $x^2 + 18x + 77 = 0$ by completing square method. (Long Question)

Solution:

$x^2 + 18x + 77 = 0$

or $(x)^2 + 2(9)x = -77$

or $(x)^2 + 2(9)x = -77 + (9)^2$ (adding 9^2 on both the sides)

or $(x + 9)^2 = 4$

or $x + 9 = \pm 2$

or $x = \pm 2 - 9$

$\Rightarrow$ $x = 2 - 9$ or $= -2 - 9$

$\Rightarrow$ $x = -7$ or $x = -11$

$\therefore$ solution set $= \{-7, -11\}$

Example 36:

Find the solution set of $6x^2 - x - 7 = 0$ by completing square method.

Solution:

$6x^2 - x - 7 = 0$

or $6x^2 - x = 7$ (adding $\left(\frac{1}{12}\right)^2$ on both the sides)

or $x^2 - \frac{1}{6}x = \frac{7}{6}$

or $x^2 - 2\left(\frac{1}{12}\right)x + \left(\frac{1}{12}\right)^2 = \frac{7}{6} + \left(\frac{1}{12}\right)^2$

or $\left(x - \frac{1}{12}\right)^2 = \frac{169}{144}$

or $\left(x - \frac{1}{12}\right)^2 = \left(\frac{13}{12}\right)^2$

or $x - \frac{1}{12} = \pm\frac{13}{12}$ *(by taking square root)*

$\Rightarrow$ $x - \frac{1}{12} = \frac{13}{12}$ *or* $x - \frac{1}{12} = -\frac{13}{12}$

$\Rightarrow$ $x = \frac{13}{12} + \frac{1}{12}$ *or* $x = \frac{-13}{12} + \frac{1}{12}$

$\Rightarrow x = \frac{14}{12}$ or $x = \frac{-12}{12}$

$\Rightarrow x = \frac{7}{6}$ or $x = -1$

$\therefore$ solution set $\left\{\frac{7}{6}, -1\right\}$

Example 37:

Solve $x^2 + 5x - 89 = 0$ by completing square method.

Solution:

$x^2 + 5x - 89 = 0$

or $x^2 + 5x = 89$

or $x^2 + 2\left(\frac{5}{2}\right)x = 89$

or $x^2 + 5x + \left(\frac{5}{2}\right)^2 = 89 + \left(\frac{5}{2}\right)^2$ (adding square of $\frac{5}{2}$ on both the sides

or $\left(x + \frac{5}{2}\right)^2 = 89 + \frac{25}{4} = \frac{345 + 25}{4}$

or $\left(x + \frac{5}{2}\right)^2 = \frac{381}{4}$

or $\left(x + \frac{5}{2}\right)^2 = \left(\frac{\sqrt{381}}{2}\right)^2$

or $x = -\frac{5}{2} + \frac{\sqrt{381}}{2}$ (taking square root of both the sides)

$\Rightarrow x = -\frac{5}{2} + \frac{\sqrt{381}}{2}$ or $x = -\frac{5}{2} - \frac{\sqrt{381}}{2}$

$\Rightarrow x = \frac{-5 + \sqrt{381}}{2}$ or $x = \frac{-5 - \sqrt{381}}{2}$

$\therefore$ solution set $\left\{\frac{-5 + \sqrt{381}}{2}, \frac{-5 + \sqrt{381}}{2}\right\}$

Example 38:

Solve $x^2 - 4x - 5 = 0$ by using quadratic formula.

Solution:

Comparing $x^2 - 4x - 5 = 0$ with $ax^2 + bx + c = 0$

$a = 1, \quad b = -4, \quad c = -5$

By quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

or $$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-5)ac}}{2(1)}$$

or $$\frac{4 \pm \sqrt{16+20}}{2}$$

or $$x = \frac{4 \pm \sqrt{36}}{2}$$

or $$x = \frac{4 \pm 6}{2}$$

$$\Rightarrow x = \frac{4+6}{2} \quad or \quad \frac{4-6}{2}$$

$$\Rightarrow x = \frac{10}{2} \quad or \quad \frac{-2}{2}$$

$\Rightarrow x = 5$ or -1

$\therefore$ solution set $= \{-1, 5\}$

Note:
The equation must be in standard from, before solving it by quadratic formula.

Example 39:

Solve $x^2 - 2x - 6 = 0$

Solution:

$x^2 - 2x - 6 = 0$

Here $a = 1, \quad b = -2, \quad c = -6$

Putting these values in the quadratic formula, we have

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-6)}}{2(1)}$$

$$= \frac{2 \pm \sqrt{4+24}}{2}$$

$$= \frac{2 \pm \sqrt{28}}{2}$$

$$= \frac{2 \pm 2\sqrt{7}}{2}$$

$$= 1 \pm \sqrt{7}$$

$$\Rightarrow = x = 1 + \sqrt{7} \quad or \quad x = 1 - \sqrt{7}$$

$\therefore$ solution set $= \left\{1+\sqrt{7}, 1+\sqrt{7}\right\}$

Example 40:

Solve $5x^2 + x - 3 = 0$

Solution:

$5x^2 + x - 3 = 0$

Here $a = 5, \quad b = 1, \quad c = -3$

Putting these values in $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, we have

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(5)(-3)}}{2(5)}$$

$$x = \frac{-1 \pm \sqrt{1+60}}{10}$$

$$x = \frac{-1 \pm \sqrt{61}}{10}$$

$$= \left\{\frac{-1+\sqrt{61}}{10}, \frac{-1-\sqrt{61}}{10}\right\}$$

Objective

Q.1 Four answers of each item are given from which only one is true. Tick the correct answer.

1. Which is an open sentence?
(Lahore Board 2009)
(a) $3>2$ (b) $x+2=3$
(c) $-3<-8$ (d) $3y<6y$

2. When two algebraic expressions are related by any of the symbols $<, >, \leq, \geq, =, \neq$, they form an ______.
(a) Algebraic sentence
(b) Algebraic expression
(c) Open sentence (d) False sentence

3. Which is an algebraic expression?
(a) $2+4>3$ (b) $3a+8$
(c) $3z-22>5$ (d) $\frac{11y}{3}<3$

4. Which is an algebraic sentence?
(a) $7a+3b$ (b) $3x+4y$
(c) $3x+2=11$ (d) $x+2y-3z$

5. Algebraic sentences are of ________ types.
(a) Two (b) Three
(c) Four (d) Five

6. The sentences which are true according to the given conditions are called _________.
(a) False sentences (b) True sentences
(c) Open sentences (d) None of these

7. Which is an open sentence;
(a) $3+2=5$ (b) $7+8<19$
(c) $2x+3=9$ (d) $6<1+2$

8. Which is a true sentence.
(a) $7+8<19$ (b) $3+18>28$
(c) $2x+5=8$ (d) $2y+3=5$

9. The sentences which are false according to given conditions are called ______ sentences.
(a) False (b) True
(c) Open (d) None of these

10. A sentence about which it is not possible to say if it is true or false is called a ____ sentence.
(a) Open (b) False
(c) True (d) None of these.

11. Open sentences are of _____ types.
(a) Two (b) Three
(c) Four (d) Five

12. Sentences involving the equality sign between two algebraic expressions are called ________ .
(a) In-equation (b) Equation
(c) Compound Sentences
(d) None of these

13. A sentence involving symbols $<$ or $>$ between two algebraic expressions is called an ______ .
(a) In-equation (b) Equation
(c) Compound Sentences
(d) Open sentences

14. Which one is a solution set of $\frac{x}{2}-6=4$
(a) $\{20\}$ (b) $\{10\}$
(c) $\{40\}$ (d) $\{100\}$

15. Which one is an equation?
(a) $3x+2<5$ (b) $\frac{3z+2}{2}=5$
(c) $\frac{7z+2}{3}<3$ (d) $3x+5>7$

16. Which one is an In-equation?
(a) $x+2=6$ (b) $4y-2=6$
(c) $5y-3>5$ (d) $\frac{3z+2}{2}=5$

17. The standard form of a linear equation in one variable is ____.

(a) $ax + b = 0$ (b) $ax + by + c = 0$
(c) $ax^2 + bx + c = 0$
(d) $ax^2 - bx - c = 0$

18. Which one is a linear equation?
(a) $x - 5 < 3$ (b) $x + 2 = \frac{-1}{2}$
(c) $5 - z > 2z$ (d) $x - 8 > 5$

19. A surface on which we plot the points is called a _______ .
(a) Cartesian Plane
(b) Horizontal Lines
(c) Vertical Lines (d) Line

20. The point at which both lines intersect perpendicularly is called _____.
(a) X-coordinate (b) Y-coordinate
(c) Origin (d) None of these

21. The first element in the ordered pair of point P is called ________.
(a) Abscissa (b) Ordinate
(c) Origin (d) None of these

22. The second element in the ordered pair of point P is called _______.
(a) Abscissa (b) Ordinate
(c) Origin (d) None of these

23. The standard form of a linear equation in two variables x and y is
(a) $ax + by + c = 0$ (b) $ax + y = 0$
(c) $ax^2 + bx + c = 0$ (d) None of these

24. The set of points at which the graph of two linear equations intersect is called the ______of both equations and that point satisfies both equations.
(a) Solution set (b) Subset
(c) Origin (d) None of these

25. Which one is a solution set of $\sqrt{x} - 8 = 2$
(a) {20} (b) {50}
(c) {100} (d) {40}

26. Which one is a solution set of $2\sqrt{3x+1} + 4 = 3$ _____.
(a) { } (b) {–2}
(c) $\left\{\frac{-1}{4}\right\}$ (d) $\left\{\frac{1}{2}\right\}$

27. Which one is a compound sentence? ***(Lahore Board 2009)***
(a) $x = 4$ (b) $x < 4$
(c) $x > 4$ (d) $x \leq -4$

28. What is the meaning of compound sentence $x \geq 5$. ***(Lahore Board 2008, 2010***
(a) $x > 5$ (b) $x = 5$
(c) $x = 5$ or $x > 5$ (d) $x < 5$

29. What is the meaning of compound sentence $-3 < x < 3$ ***(Lahore Board 2008)***
(a) $x > 3$ (b) $x > -3$
(c) $x < -3$ (d) $-3 < x$ and $x < 3$

30. Which one is a solution set of $\sqrt{x} = -3$ ***(Lahore Board 2010)***
(a) {–3} (b) { }
(c) {9} (d) {3}

31. Which one is a solution set of $|x| + 5 = 2$
(a) { } (b) {3, –3}
(c) {7, –7} (d) {–3, 7}

32. Which one is a solution set of $|x + 2| = 3$ ***(Lahore Board 2010***
(a) {–1, 5} (b) {1, 5}
(c) {–1, –5} (d) {1,–5}

33. Which one is a solution set of $\sqrt{x} - 5 = -2$
(a) {3} (b) {–9}
(c) {9} (d) {–7}

34. Which one ordered pair satisfies $x - y = 3$ ***(Lahore Board 2010***
(a) (0, 3) (b) (3, 0)
(c) (2, 1) (d) (1, 2)

35. Which one is a solution set of $x < 4$ (When $x \in W$)
(a) {0, 1, 2, 3} (b) {0, 1, 2, 3, 4}
(c) {1, 2, 3, 4} (d) {1, 2, 3}

36. Which one is a solution set of $|2x| = 6$ _____ (When $x \in R$) .

(a) $\{3, -3\}$ (b) $\{3\}$
(c) $\{-3\}$ (d) $\{9\}$

37. Which one is a solution set of $\left|\frac{y+2}{3}\right| - 3 = -5$ _____.

(a) $\{-2\}$ (b) $\{\ \}$
(c) $\{2\}$ (d) $\{0\}$

38. Which one is a solution set of $6x-8<x+7$ _______ $(x \in R)$

(a) $\{x | x \in R \wedge x < 3\}$
(b) $\{x | x \in R \wedge x > 3\}$
(c) $\{x | x \in R \wedge x \leq 3\}$
(d) None of these

39. Which one is a solution set of $1 < x < 4$ is _______ (When $x \in N$)

(a) $\{1, 2, 3\}$ (b) $\{2, 3\}$
(c) $\{2, 3, 4......\}$ (d) $\{2,3,4\}$

Note:
$1 < x < 4$, there are two relations as $x > 1$ and $x < 4$
If $x \in N$ Then $x < 4 \Rightarrow x = \{1, 2, 3\}$
and if $x > 1 \Rightarrow x = \{2, 3, 4.....\}$
Solution set $= \{1, 2, 3\} \cap \{2, 3, 4.....\}$
$= \{2, 3\}$

40. Which one is a solution set of $|x-2| \leq 4$ (when $x \in R$) ___

(a) $\{x | x \in R \wedge -2 \leq x \leq 6\}$
(b) $\{x | x \in R \wedge -2 < x < 6\}$
(c) $\{x | x \in R \wedge -2 \leq x \leq -6\}$
(d) $\{x | \in R \wedge -2 \geq x\}$

41. The standard form of the quadratic equation in one variable 'x' is ___.

(a) $ax + b = 0$ (b) $ax^2 + bx + c = 0$
(c) $ax^2 + b = 0$ (d) $ax - b = 0$

42. Which one is a solution set of $x^2 + 7x + 12 = 0$

(a) $\{-4, -3\}$ (b) $\{4, 3\}$
(c) $\{-4, 3\}$ (d) $\{4, -3\}$

43. Which one is a solution set of $(y-2)(y+3) = 0$ ______ .

(a) $\{2, -3\}$ (b) $\{-2, -3$
(c) $\{-2, 3\}$ (d) $\{2, 3\}$

44. Which one is a solution set of $3x(x-1) = 0$.

(a) $\{0, 1\}$ (b) $\{2, 0\}$
(c) $\{-1, 0\}$ (d) $\{0 - 1\}$

45. Which one is a solution set of $(x-2)^2 = 9$.

(a) $\{-5, 1\}$ (b) $\{5, -1\}$
(c) $\{1, -5\}$ (d) $\{-1, -5\}$

46. Which one is a solution set of $|x+3| > 5$ (When $x \in R$).

(a) $\{x | x \in R \wedge x > 2 \vee x < -8\}$
(b) $\{x | x \in R \wedge x > -2 \vee x < -8\}$
(c) $\{x | x \in R\ x > 2\}$
(d) $\{x | x \in R \wedge x < -8\}$

47. Which one is a solution set of $|x+2| < 4$ (*When* $x \in R$).

(a) $\{x | x \in R \wedge -6 < x < -2\}$
(b) $\{x | x \in R \wedge -6 < x < 2\}$
(c) $\{x | x \in R \wedge -2 \leq x \leq 6\}$
(d) $\{x | \in R \wedge -2 \geq x\}$

48. Which one is a solution set of $\sqrt{t} - 10 = 2$ is _______.

(a) $\{10\}$ (b) $\{100\}$
(c) $\{144\}$ (d) $\{1000\}$

49. Which one is a solution set of $\sqrt{3y+3} = \sqrt{y-5}$ is _____.

(a) {4} (b) {2}

(c) {-4} (d) $\left\{\frac{1}{4}\right\}$

50. Which one is solution set of $\sqrt{\frac{x+1}{2}} = 2$ is _____.

(a) {7} (b) { 0 }

(c) { 2 } (d) {4}

51. Which one is solution set of $-3x = x$ is _____.

(a) {0} (b) { }

(c) {2} (d) {1}

52. Which one is solution set of $|2x| = 8$ is _____ (When $x \in R$)

(a) {–4, 4} (b) {4}

(c) {–9} (d) {9}

53. Which one is solution set of $\sqrt{y} = -3$ is _____.

(a) { } (b) {0}

(c) {–9} (d) {9}

54. Which one is solution set of $\sqrt{x} = 3$ is _____.

(a) {8} (b) {9}

(c) {3} (d) {–3}

55. Which one is solution set of $3x + y = 4$ is _____ (When $x, y \in N$)

(a) {(3, 1)} (b) {(2, 1)}

(c) {(1, 1)} (d) {0,1}

56. Which one is solution set of $3x + 3 = 6$ is _____.

(a) {1} (b) {0}

(c) {3} (d) { }

57. If $x = y$ then $x^n =$ _____ $\forall x, y \in R$ and $\forall n \in N$

(a) y^n (b) $\frac{1}{y^n}$

(c) $\frac{1}{x^n}$ (d) x^n

58. Which one is solution set of $|3x| = 6$ is _____ (When $x \in N$)

(a) {3} (b) {-2}

(c) {–3, 3} (d) {2}

59. Which one is solution set of $\left|\frac{y+2}{3}\right| - 4 = -5$ is _____.

(a) {0} (b) { }

(c) {–3} (d) {–5}

60. The relation x < y < z is equivalent to three relations _____.

(a) x<y, y<z, x<z (b) x>y, y<z, x<z

(c) x>y, y>z, x<z (d) x>y, y<z, x>z

61. Which one is solution set of $6x - 8 < x + 7$ $(x \in R)$ is _____.

(a) $\{x | x \in R \wedge x < 3\}$

(b) $\{x | x \in R \wedge x > 3\}$

(c) $\{x | x \in R \wedge x \leq 3\}$

(d) $\{x | x \in R \wedge x \geq 3\}$

62. If x<y ⇨ – x _____ – y.

(a) < (b) >

(c) = (d) ≠

63. Which one is a compound sentence?

(a) $1 < x < 4$ (b) $1 > x$

(c) $x > 4$ (d) $x < 3$

64. Which one is solution set of $ax^2 + bx + c = 0$

(a) $\left\{\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\right\}$

(b) $\left\{\frac{-b - \sqrt{b^2 - 4ac}}{2a}\right\}$

(c) $\left\{\frac{-b+\sqrt{b^2-4ac}}{2a}\right\}$

(d) $\{b^2-4ac\}$

65. The solution set of the equation ____ is $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

(a) $ax^2+bx+c=0$ (b) $ax+by+c=0$

(c) $ax+b=0$ (d) $ay^2+bx+c=0$

66. The solution set of $x^2-5x=0$ is _______

(a) $\{-5, 5\}$ (b) $\{0, 5\}$

(c) $\{\ \}$ (d) $\{0\}$

67. The formula with the help of which quadratic equation is solved can be derived from method of ____.

(a) Completing the square

(b) factorization

(c) $ax^2+bx+c=0$ (d) None of these

68. A quadratic equation in one variable has

(a) one root

(b) infinite number of roots

(c) no root (d) two roots

69. The solution set of $x^2-x-2=0$ is _____.

(a) $\{1\}$ (b) $\{2\}$

(c) $\{2, -1\}$ (d) $\{-1\}$

70. The solution set of $3x^2-10x=0$ is _____.

(a) $\{10\}$ (b) $\{0, \frac{10}{3}\}$

(c) $\{\frac{10}{3}\}$ (d) $\{0\}$

71. An equation may or may not be ____.

(a) algebraic sentence

(b) close sentence

(c) open sentence (d) None of these

72. An equation remains unchanged if any number is added to its both sides. This property is called.

(a) addition property of equation

(b) property of additive inverse

(c) commutative property of addition

(d) associative property of addition

73. $ax^2+bx+c=0$ is the _____ form of quadratic equation in one variable.

(a) standard (b) exponential

(c) radical (d) non-standard

74. The exponent of a variable in the quadratic equation is _____.

(a) 3 (b) 1

(c) 2 (d) 4

75. The solution of a quadratic equation by factorization is based on the result that if $ab = 0$, $a, b \in R$ then there are — possibilities.

(a) two (b) three

(c) four (d) None of these

Note: if $ab = 0$, $a, b \in R$ then there are three possibilities $a = 0$ or $b = 0$ or $a = b = 0$

76. The solution set of $z(z-1)=0$ is ______.

(a) $\{\ \}$ (b) $\{0, 1\}$

(c) $\{0\}$ (d) $\{1\}$

77. The solution set of $(2y+1)^2=36$ is ____.

(a) $\left\{\frac{5}{2}, \frac{-7}{2}\right\}$ (b) $\left\{\frac{5}{2}\right\}$

(c) $\left\{\frac{-7}{2}\right\}$ (d) $\left\{\frac{7}{2}, \frac{5}{2}\right\}$

78. The standard form of linear equation in two variable is _____

(a) $ax+b=0$ (b) $ax+by+c=0$

(c) $ax^2+by+c=0$ (d) $ax^2+ac=0$

79. The standard form of quadratic equation in one variable 'y' is ___

(a) $ax^2+bx+c=0$

(b) $ay^2+by+c=0$

(c) $ax+b=0$ (d) $ax+by+c=0$

80. The solution set of $2x+1<5$ is ____ (when $x \in W$).

(a) $\{0\}$ (b) $\{0, 1\}$

(c) $\{1\}$ (d) $\{0, -1\}$

81. The solution set of $x - y = 2$ and $x - y = 1$ is ______. *(Lahore Board 2005)*
(a) $\{\ \}$ (b) $\{(2, 0)\}$
(c) $\{(2, 1)\}$ (d) $\{(0, 2)\}$

82. The solution set of $x + y = 1$ and $x - y = 3$ is __
(a) $\{(2, 0)\}$ (b) $\{(2, -1)\}$
(c) $\{0, 2\}$ (d) $\{(-1, 2)\}$

83. The solution set of $2x + y = 4$ and $x - y = 2$ is ____
(a) $\{(2, 0)\}$ (b) $\{(0, 2)\}$
(c) $\{(2, 2)\}$ (d) $\{(-1, 2)\}$

84. Which one is a linear equation?
(a) $\ell x + m = 0$ (b) $5 - z > 2z$
(c) $x - 5 < 3$ (d) $3y + 8 < 11$

85. Which one is an equation?
(a) $3x + 2 = 5$ (b) $3x + 2 > 10$
(c) $3y + 8 < 11$ (d) $x > 8$

86. Which one is algebraic expression?
(a) $2x + 3$ (b) $2x = 1$
(c) $2x - 5 < -3$ (d) $\frac{x-1}{2} = \frac{2}{3}$

87. Which one is algebraic sentence?
(a) $3x + 2y + z$ (b) $2x - 5 < -3$
(c) $\frac{1}{\sqrt{3}}\ z - 1$ (d) $2x + 3$

88. Which is an open sentence?
(a) $3 + 4 < 2x$ (b) $7 - 3 > 12$
(c) $15 - 8 < 12$ (d) $3x + 5x = 8x$

89. Which is an true sentence?
(a) $3x + 2x > 4x$ (b) $3 + 4 = 6$
(c) $-6 + 4 > 2$ (d) $4 + 4 = 6$

90. Which is a false sentence?
(a) $-6 + 4 > 2$ (b) $7 + 5 > 6$
(c) $3x + 2x > 4x$ (d) $-7 < 15$

(Answers)

1.	b	**2.**	a	**3.**	b	**4.**	c	**5.**	b	**6.**	b	**7.**	c
8.	a	**9.**	a	**10.**	a	**11.**	a	**12.**	b	**13.**	a	**14.**	a
15.	b	**16.**	c	**17.**	a	**18.**	b	**19.**	a	**20.**	c	**21.**	a
22.	b	**23.**	a	**24.**	a	**25.**	c	**26.**	a	**27.**	d	**28.**	c
29.	d	**30.**	b	**31.**	a	**32.**	d	**33.**	c	**34.**	b	**35.**	a
36.	a	**37.**	b	**38.**	a	**39.**	b	**40.**	a	**41.**	b	**42.**	a
43.	a	**44.**	a	**45.**	b	**46.**	a	**47.**	b	**48.**	c	**49.**	c
50.	a	**51.**	a	**52.**	a	**53.**	a	**54.**	b	**55.**	c	**56.**	a
57.	a	**58.**	d	**59.**	b	**60.**	a	**61.**	a	**62.**	b	**63.**	a
64.	a	**65.**	a	**66.**	b	**67.**	a	**68.**	d	**69.**	c	**70.**	b
71.	c	**72.**	a	**73.**	a	**74.**	c	**75.**	b	**76.**	b	**77.**	a
78.	b	**79.**	b	**80.**	b	**81.**	a	**82.**	b	**83.**	a	**84.**	a
85.	a	**86.**	a	**87.**	b	**88.**	a	**89.**	a	**90.**	a		